ABSTRACT (DA PAM 350-16)

U.S. ARMED FORCES BASE DEVELOPMENT EXPERIENCES IN ASIA, 1965-1969: A HISTORICAL REVIEW AND IMPLICATIONS FOR FUTURE BASE DEVELOPMENT ACTIONS

MAJOR ALFRED J. THIEDE

25 JUNE 1971

297 PAGES

This thesis examines recent American attitudes towards war; the role of construction in the theater of operations; present trends effecting base development planning and execution; base development activities in Asia between 1965 and 1969; lessons learned from these experiences; the status of corrective actions and investigations; joint and Services doctrine concerning base development; the Service functional component systems; and numerous automatic data processing systems adaptable to base development.

From an investigation of these areas, a framework (the JIBES) from which a joint, integrated system of base development planning and execution, incorporating joint functional component and ADP systems, may be developed.

U.S. ARMED FORCES BASE DEVELOPMENT EXPERIENCES IN ASIA, 1965-69: A HISTORICAL REVIEW AND IMPLICATIONS FOR FUTURE BASE DEVELOPMENT ACTIONS

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements of the
degree

MASTER OF MILITARY ART AND SCIENCE

by

ALFRED J. THIEDE, MAJOR, EN
B.S., Chemistry, De Paul University, Chicago, Illinois, 1957
B.S., Civil Engineering, University of Missouri, Rolla, Missouri, 1965

Fort Leavenworth, Kansas
1971

THESIS APPROVAL PAGE

Name of Candidate ALFRED J. THIEDE, MAJOR, EN

Title of Thesis U.S. ARMED FORCES BASE DEVELOPMENT EXPERIENCE IN ASIA, 1965-69: A HISTORICAL REVIEW AND IMPLICATIONS FOR FUTURE BASE DEVELOPMENT ACTIONS

Approved by:

[signature] LTC, CE, Research and Thesis Advisor

[signature] LTC, Member, Graduate Research Faculty

[signature] Maj AGC, Member, Graduate Research Faculty

Robert L. King, Maj, FI, Member, Consulting Faculty

Date: 19 July 1971

The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

U.S. ARMED FORCES BASE DEVELOPMENT EXPERIENCES IN ASIA,
1965-69: A HISTORICAL REVIEW AND IMPLICATIONS
FOR FUTURE BASE DEVELOPMENT ACTIONS

An abstract presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements of the
degree

MASTER OF MILITARY ART AND SCIENCE

by

ALFRED J. THIEDE, MAJOR, EN
B.S., Chemistry, De Paul University, Chicago, Illinois, 1957
B.S., Civil Engineering, University of Missouri, Rolla, Missouri, 1965

Fort Leavenworth, Kansas
1971

ABSTRACT APPROVAL PAGE

Name of Candidate ALFRED J. THIEDE, MAJOR, EN

Title of Thesis U.S. ARMED FORCES BASE DEVELOPMENT EXPERIENCE IN ASIA, 1965-69: A HISTORICAL REVIEW AND IMPLICATIONS FOR FUTURE BASE DEVELOPMENT ACTIONS

Approved by:

LTC, CE, Research and Thesis Advisor

LTC, Member, Graduate Research Faculty

Maj, AGC, Member, Graduate Research Faculty

Robert L. King, Maj, FI, Member, Consulting Faculty

Date:

The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

This thesis examines recent American attitudes towards war; the role of construction in the theater of operations from World War I to the present; present trends effecting future base development planning and execution; base development planning and execution in Vietnam, Thailand and Korea between 1965 and 1969; lessons learned from these experiences; the status of corrective actions and investigations; current joint and Services doctrine concerning base development; the Service functional component systems, including the Air Force's Bare Base Mobility Concept; and numerous automatic data processing systems adaptable to base development, including PRESCORE, STINGER and SIGMALOG.

These areas are investigated with a view toward providing a framework from which a joint, integrated system of base development planning and execution may be developed which incorporates pre-engineered, prefabricated, modular, relocatable structures as part of a joint functional components system to the utmost, and utilizes a joint automatic data processing system and streamlined contingency funding/programing and real estate acquisition procedures at all joint and Service levels to expedite actions and provide responsiveness.

The historical and descriptive research methods are used to present the data. A brief historical sketch is employed to show the general role of construction in the theater of operations; a more detailed historical development is given to highlight recent base development planning and execution in Asia. The descriptive method is used to present the other data.

The bulk of the historical information was obtained from books, periodicals, unpublished works and official studies available in the Command and General Staff College (C&GSC) Library and the Institute of Combined Arms Studies (ICAS), Fort Leavenworth, Kansas. Also, unpublished works from other joint and Service colleges and the author's personal experience constituted a significant source of input data.

The majority of the descriptive data was found in studies, reports and investigations conducted by both government and non-governmental research organizations, obtained primarily through the services of the Defense Logistic Studies Information Exchange and the Defense Documentation Center. A substantial portion of this information was also gleaned from manuals, regulations, studies and reports available in the C&GSC Library, and in various offices of ICAS and C&GSC.

As a consequence of the research, a joint, integrated system for base development planning and execution (the JIBES system) is presented to serve as a framework for further investigation and development. This system takes advantage of recently learned lessons concerning base development, and emphasizes the maximum use of the most modern technology available to the construction industry. Properly improved and developed, it should eliminate the deficiencies encountered in Vietnam and elsewhere, and reduce duplication of facilities and effort to a minimum.

Founded upon an examination of the available data, the following additional major conclusions are presented.

1. The United States will be involved in future contingency operations.

2. The prudent use of time will be more essential than ever in these operations.

3. These contingencies will tend to be of the fixed enclave variety, thus maximizing construction requirements.

4. Key recommendations of the Joint Logistics Review Board and the Special Military Construction Study Group not yet acted upon appear worthy of implementation; joint and Service doctrine should be revised accordingly.

5. The JIBES system proposed in the thesis provides a framework for development of a joint, integrated system for base development planning and execution which should be further pursued with a view toward improvement as needed and eventual implementation.

6. To effectively support a system like the JIBES, development of a joint functional component system and a joint ADP system is essential.

7. To increase responsiveness in a system like the JIBES, there is a crucial need for developing streamlined contingency funding and real estate procedures, and having supporting documents prepared prior to implementation of OPLANS.

8. Recent and continuing improvements in logistical concepts tend to reduce logistical requirements in a combat theater, but do not eliminate the need for forward depots, and increase the need for speed in construction and prestockage of War Reserve Materials.

9. Establishment of adequate, well-trained base development staffs at all joint and Service levels is imperative.

Based on the foregoing conclusions, the following recommendations are made.

1. Adoption and implementation by DOD/JCS of the key recommendations of the Joint Logistics Review Board and the Special Military Construction Study Group which have not as yet been acted upon.

2. Revision of DOD/JCS and Service regulations to incorporate the new concepts.

3. Establishment or designation of a joint group, responsive to the Construction Board for Contingency Operations, to develop a joint, integrated system for base development planning and execution suitable for use by all the Services and DOD/JCS in base development planning and execution. The JIBES should be used as a starting point for the investigation.

4. Establishment or designation of a similar group to make a joint, integrated functional components system operational to serve as the backbone of any joint planning and execution system developed.

5. Establishment or designation of another similar group to develop a joint, integrated automated data processing system to support any planning and execution system developed.

6. Establishment or designation of yet another group to develop streamlined contingency programing/funding and real estate acquisition procedures to make any planning and execution system developed more responsive.

7. Procurement and prestockage of sufficient functional components to insure early and substantial support of combat forces during at least the first six months of a "half-war" contingency.

8. Establishment of adequate base development staffs at all levels.

ACKNOWLEDGEMENTS

The writer wishes to express his appreciation and thanks to the numerous people who made this work possible. The writer is greatly indebted to his research committee, particularly its chairman, LTC Charles D. Bakeman, whose helpful guidance and counsel were a source of inspiration throughout the work. A particular debt of gratitude is due LTC Clifford V. Lambert, the former ICAS Base Development Project Officer, for his advice and aid in the crucial early stages of the investigation. The staff and faculty were also influential, especially LTC Thomas A. Rehm, LTC Arthur H. Schultz and LTC John F. Hatch, as were fellow students who contributed in many ways toward bringing this study to a successful conclusion. The writer is especially grateful to his family - the children, [redacted] who were very understanding during the trying periods of research and writing, and particularly his wife, [redacted] whose encouragement and draft typing assistance were so necessary to complete this work.

A.J.T.

TABLE OF CONTENTS

Page

Page

Page

LIST OF TABLES

LIST OF FIGURES

Chapter I

THE NEED

Historically, construction has played a significant role in warfare. Construction is needed to provide facilities for the logistical and administrative support base and the lines of communications required to sustain modern military forces in a theater of operations. As a recent Army Materiel Command chief stated, "Marshalling of the materials to supply our men in Vietnam requires depots, hospitals, ports, transportation of all types and petroleum — hundreds of thousands of items are received and distributed to the depots and stored and catalogued so that issues can be made quickly and wherever needed". He also says that monthly shipments to Vietnam in 1967 were on the order of 1,000,000 tons of dry cargo.[1] Frequently the lack of adequate base support facilities and lines of communications will impose severe restrictions upon a theater commander in the conduct of a campaign. Also, the broad scope of a theater of operations construction program, the time-distance factors involved, the traditional shortages of construction troops and materials, combined with the uncertainties of warfare, will

---

[1]Frank S. Besson, Jr. (Gen, U.S.A.), "Logistics Keeps the Army Rolling in Vietnam", TRANSLOG (formerly Transportation Proceedings) (April 1967), p. 2.

present many problems for the commander and his staff to solve in planning and executing the theater construction program. However, thorough, detailed and timely base development planning can do much to minimize the problems encountered in executing the construction program and providing the needed facilities at the proper time.

This paper will review the attitudes affecting execution of a wartime construction program, the role of construction in past wars, recent theater of operations construction experiences and present methods of handling base development planning and execution, and study actions which might be taken to improve this Nation's ability to rapidly provide essential facilities in any future wars. After an analysis of the data, a framework from which a joint, integrated approach to base development planning and execution may be further investigated and developed is proposed.

RECENT AMERICAN ATTITUDES TOWARD WAR

Time is one of the most valuable resources available to the military manager. It is very unlikely that a future analyst will be able to say, "The last war was brought to an end by weapons and devices conceived, developed and produced after the war started".[2] That this could be uttered in reference to World War II was a function of circumstances that shall probably not occur again.

---

[2]J. R. Goldstein, The History, Operations and Goals of a Non-Profit Corporation, P-2236-1 (Santa Monica, Calif.: The Rand Corporation, April 1961), p. 1.

The United States was not drawn into the war for more than two years after hostilities began in 1939. Even after Pearl Harbor, the combat capabilities of the enemy were so low that this nation had the lead time to mobilize, transport and maintain abroad the forces essential for ultimate victory. Even so, this lead time was purchased at the sacrifice of almost 15 percent of the prewar Regular Army.[3] The impact of these losses on the subsequent conduct of the war, while difficult to access, must have been considerable. The conclusion to be drawn appears to be that the World War II technique of mobilization of the force after the battle had been joined was militarily undesirable, but bearable, and perhaps inevitable in light of existing political and economic conditions.

Much has been written concerning the proposition that this procedure will not be possible in the event of a general nuclear war. It is not within the scope of this thesis to prove this point, but it should be pointed out that the Army recognizes the likelihood that such an engagement may be fought with the resources immediately available, or very nearly so.[4] What might not be so obvious is that a gradual mobilization of force, with a concurrent gradual escalation of the intensity of the conflict, is, in this era, equally unacceptable

---

[3]U.S., Department of the Army, American Military History, 1607-1958, ROTCM 145-20 (Washington: U.S. Government Printing Office, 1959), pp. 372 & 386.

[4]U.S. Army Command and General Staff College, Current and Future Combat, Combat Support and Combat Service Support Systems, Subj. R5620 (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College [Academic Year 1970-71]), Advance Sheet.

for the conduct of a limited war. Again, for contrast, one can look to World War II, when President Franklin D. Roosevelt said, "No matter how long it may take us to overcome this premeditated invasion, the American people, in their might, will win through to absolute victory."[5] That he was expressing the sentiments of the people is exemplified by the fact that there is no evidence that public opinion at any time exercised constraints against the administration's pursuit of absolute victory. Further, there is no evidence that an appreciable segment of such opinion even existed. This condition is not characteristic of the limited war.

At the start of the Korean Conflict, the policy of United States intervention appears to have enjoyed popular support. Time Magazine, in October of 1950, stated, "Across the nation there was solid popular agreement that Harry Truman had acted wisely and swiftly."[6] This was also a period of ambitious goals. The national objective in Korea was supported by a resolution with strong United States backing which was passed by the United Nations General Assembly to affirm that "all appropriate steps [would] be taken to insure conditions of stability throughout Korea," and to call further for (1) free United Nations sponsored elections and establishment of a democratic regime

---

[5]U.S., Congressional Record, 77th Cong., 1st Sess., December 1941, CLXXXVII, No. 219, 9750.

[6]"War in Asia", Time Magazine, LVI, No. 2 (July 10, 1950), p. 9.

for all Korea and (2) a seven-nation United Nations commission to help set up the new government.[7]

Two years later the public mood and the objectives had changed. This occurred even though United Nations Forces had enjoyed considerable success in battle and had forced the Communists, through Jacob Malik, Soviet Representative to the United Nations, to suggest an armistice.[8] General Eisenhower was elected in 1952, partly on the premise that he would reduce American involvement and negotiate a settlement. In fact, in his famous campaign speech of October 1952, he promised to go personally to Korea to bring about a "just peace" and further recommended the following measures:

> (1) a step-up in training and arming South Koreans, they . . . [could] bear the chief brunt of their defense, with U.N. Forces in reserve; and (2) a sharpening of psychological warfare "into a weapon capable of cracking the Communist front".[9]

The desire to unify Korea had vanished. The magnitude of the public disillusionment with the Truman policy was indicated by the

---

[7]Trygve Lie, In the Cause of Peace (New York: Macmillan, 1954), p. 345. "As reported by D. M. O'Shei, Maj, USA, Recommendations for Initiation and Administration of Troop Construction in the Limited War Theater of Operations", Thesis: U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1968, p. 4.

[8]Vincent J. Esposito (ed.), The West Point Atlas of American Wars (New York: Praeger, 1959), Vol. II, Facing Map, p. 14.

[9]"National Affairs", Time Magazine, LXIV, No. 18 (November 3, 1952), p. 22.

442 to 89 electoral vote defeat of its proponent, Governor Stevenson, in 1952.[10] Naturally, the settlement eventually negotiated fell short of previous expectations.

A more dramatic example of the same process has been evident in the Vietnam War. Once again the pattern appears. Early in the conflict the government took a hard line. When, in 1964, Charles de Gaulle proposed a negotiated neutralization of South Vietnam, the United States failed to answer. Senator Mike Mansfield meekly suggested that the proposal "ought not to be dismissed out of hand", and was criticized by Senator Everett Dirksen, who pointed to Laos and Cambodia as "'bitter experience' with neutralism".[11] According to a Gallup poll conducted in August of 1964 only 16 percent of the U.S. public was dissatisfied with the conduct of the War.[12] After the Gulf of Tonkin incident in August of 1964, the Senate, by a vote of 88-2, and the House of Representatives, by a vote of 414-0, passed a resolution which said, in part:

> The United States is therefore prepared, as the President determines, to take all necessary steps, including the use of armed forces to assist any member of protocol, state of the Southeast Asia Collective Defense Treaty, requesting assistance in defense of its freedom.[13]

---

[10] The World Almanac and Book of Facts, 1967 (New York: Newspaper Enterprises Association, 1967), p. 414.

[11] "Pullout from Vietnam: It's Still Scheduled", U.S. News and World Report, LVI, No. 9 (March 2, 1964), p. 7.

[12] "Significant Rumblings", Newsweek, LXV, No. 3 (January 18, 1965), p. 33.

[13] U.S. Congressional Record, 88 th Cong., 2d Sess., August 1964, CX, No. 153, 1788 75.

That President Lyndon Johnson believed Congress is history.

However, a few years later, as it had with the Korean Conflict, the nation's viewpoints changed appreciably. Protest of the country's involvement had become routine. Two Democratic Senators, McCarthy of Minnesota and Robert Kennedy of New York, were challenging Lyndon Johnson for the presidential nomination. Both advocated negotiation and recommended cessation of bombing in North Vietnam and a coalition government for South Vietnam which would include the National Liberation Front.[14] The pressures on the administration became so great that on March 30, 1968 President Johnson announced that he, in order to promote negotiations, was cancelling offensive air action against the North, except immediately above the demilitarized zone, and also, that he would not seek reelection.[15]

That President Nixon has been subjected to even greater pressures is only too evident from reading, listening to and viewing the news media. Although at this time it is impossible to predict the final outcome of the Vietnam War it seems highly probable that the results achieved will be much less than this nation would have considered acceptable in 1964 and 1965.

An important lesson to be learned from the events of both Korea and Vietnam is that the President in a limited war situation practices the possible. Time is his enemy, for unsupported by the

---

[14]Many sources, including nationally televised press conferences by Senators Eugene J. McCarthy and Robert F. Kennedy in early 1968.

[15]National television address by President Lyndon B. Johnson, March 31, 1968, reported in The New York Times, April 1, 1968, p. 1.

fight for survival characteristic of general war, the public loses enthusiasm. This loss, bolstered by the graphic and grizzly detail made available to the American home by modern news media, can turn into active opposition. President Johnson recognized the seriousness of this effect in an address to the National Association of Broadcasters, when he pondered how the course of history might have been affected had such World War II setbacks as the early phases of the Battle of the Bulge or the air losses sustained in the Battle of Midway been subjected to modern television coverage.[16]

The foregoing does not indicate that Americans are opposed to war per se. Ironically, at the time public support of this Nation's war effort in Vietnam was declining, there was considerable approval evident for one being waged by another nation. In June, 1967 more than 3,700 university professors throughout the country supported, in a signed newspaper statement, the military activities of Israel in her war against the Arabs.[17] Newsweek reported:

> Doves on Vietnam turned hawkish in defense of Israel and insisted there was no contradiction in their stand . . . The first Louis Harris survey on the war found substantial American sympathy and support for Israel.[18]

---

[16] Address by President Lyndon B. Johnson to the National Association of Broadcasters, Chicago, April 1, 1968, reported in the Kansas City Times, April 2, 1968.

[17] "The Nation", Time Magazine, LXXXIX, No. 24 (June 16, 1967), 17.

[18] "Give as You Never Gave", Newsweek, LXIX, No. 24 (June 19, 1967), 35.

The Israeli-Arab War differed from Korea and Vietnam primarily in that it was, although bloody and brutal, blessedly brief, and public opinion did not have a chance to wane. Pondering this point, in contrast to the situation earlier examined, seems to indicate that if a limited war is to be completely successful it must be won in what may appear to the traditionally oriented political and military practitioner to be an unreasonably short time.

It has been said that "the American armed forces are the principal instrument for diplomacy with . . . the countries we recognize as potential enemies."[19] If they are to maintain this role, they must learn to deal with the relationship of time and public opinion discussed above. A chief executive forced by preventable delays into a position where his objectives must be degraded or abandoned is not being well served. There are more than political implications to the fact that three of America's last five administrations have floundered on the shoals of limited war difficulties. Adversaries of this nation are inevitably going to question its willingness or capability to augment flexible response. The United States would not be the first major power whose determination to pursue a tough military line was open to question. Perceive the Corinthian delegates:

---

[19] Thomas C. Schelling, Managing the Arms Race in National Security: Political, Military and Economic Strategies in the Decade Ahead (New York: Praeger, 1963), p. 601.

> You Spartans are the only people in Hellas who wait calmly on events, relying for your defense not on action but on making people think that you will act. You do nothing in the early stages to prevent an enemy's expansion; you wait until your enemy has doubled his strength. Certainly you used to have the reputation of being safe and sure enough; now one wonders whether this reputation was deserved.[20]

The purpose of this extended discussion has been to try to establish beyond doubt the importance of time in the conduct of the future limited war. It is clear that proper management of time in initiating and carrying out such operations must be as much the mark of military professionalism as the ability to skillfully handle combat power. Because of this, an attempt has been made to develop the theme that this Nation's capability to successfully engage in future limited wars rests on how well available time is used.

One of the determining factors in the time needed to mount an off-shore military operation is the development of the logistics and administrative base required to support the force employed. One of the prime ingredients in this consideration, in terms of time, cost, and effort, is the planning and construction of the component facilities of such a base.[21] It is the writer's contention that the United States has failed to develop an adequate capability in this field and that the recent performances in Vietnam, Thailand and Korea, impressive as they were, plus current base development planning doctrine and execution procedures, support this thesis.

---

[20] Thucydides, The Peloponnesian War, trans. by Rex Warner (New York: Penquin Books, 1954), p. 50.

[21] D. M. O'Shei (Maj, U.S.A.), "Recommendations for Initiation and Administration of Troop Construction in the Limited War Theater of Operations," Thesis, U.S. Army Command an General Staff College, Fort Leavenworth, Kansas, 1968, pp. 1-12.

THE ROLE OF CONSTRUCTION IN THE THEATER OF OPERATIONS — A HISTORICAL SKETCH

This section briefly reviews the role of construction in contingencies from World War I through the "Pueblo" Incident.

WORLD WAR I

The need for construction in an overseas theater of operations became important to U.S. Forces in World War I.

> The character of war had changed, and the construction of ports, supply bases, railroads, bridges, power and water utilities, hospitals and other means of supporting an expeditionary force of 2 million men fighting almost 4,000 sea and land miles from home was a new and challenging experience.[22]

World War I armies were relegated to trench warfare partly because of inadequate roads. "French roads were torturous channels of mud through which military columns crawled or stalled while engineer troops labored with hand tools to spread rock in almost futile attempts to keep essential traffic moving".[23]

WORLD WAR II

During World War II construction was again a substantial element of the total war effort. Although the United States was

---

[22] U.S., Congressional Record, 87th Cong., 1st Sess., 107, No. 94, June 6, 1961, A4077.

[23] Samuel D. Sturgis, Jr., (Lt.Gen., U.S.A.), "Construction Power is Combat Power", Army, 6, No. 9, April 1956, 15.

quickly developing a wartime capability by 1941, much remained to be done to attain the full war footing required by the attack on Pearl Harbor. "The engineers had to answer an early and persistant call for construction troops to circle the world with airfields, to build strategic roads in Canada and Alaska, China and Burma, and to provide shelter for troops and supplies everywhere".[24] Operation BOLERO, the build-up of the U.S. war machine in Great Britain, included a large base development effort that was jointly accomplished by the British and Americans. Besides the success of the operation, there were some unique problems involved that deserve note. "The procedure for arranging for new construction was a cumbersome one, - - - that might involve several British governmental agencies".[25] Likewise, the British were upset by frequent revisions to American plans. The tremendous quantity of construction worldwide during World War II understandably created demands for enormous quantities of construction materiel. Supply procedures were hampered by a lack of information from the theaters: "- - - the data were neither detailed enough nor submitted far enough in advance of operations to serve as a firm basis for requirements. Descriptions of projects were frequently sketchy; bills of materials incomplete."[26] In spite of these and

---

[24]Blanche D. Coll, et al., United States Army in World War II, The Technical Services, The Corps of Engineers; Troops and Equipment (Washington: U.S. Government Printing Office, 1958), pp. 143-144.

[25]Ibid., p. 505.

[26]Roland G. Ruppenthal, United States Army in World War II - Logistic Support of the Armies (Washington: U.S. Government Printing Office, 1953), I, 241-242.

numerous other problems the Army completed approximately $125 million of construction per month from mid-1940 until the onset of the war; then the tempo surged to a peak of $720 million in July, 1942. A total of $10.6 billion was constructed in the United States from June 1940 to May 1946. An additional $5 billion was expended in the continental United States (CONUS) for war-related construction such as essential civil works improvements to rivers and harbors and facilities for the Manhattan Project. Army forces overseas placed approximately $10 billion worth of work.[27] However, not all this construction was always beneficial, as seen below.

General Stillwell's campaign plans in the China-Burma-India Theater were somewhat frustrated by the lack of a land line of communications into China. Construction of an all-weather road from the small coal mining town of Ledo, in Northwest India, across Northern Burma and connecting with the Burma Road leading into China, was to provide a line of communication from the ports of India into China. Construction of the Ledo Road, which crossed rugged mountains and jungles, was started in October 1942 and finished in January 1945. Although this road rates as one of the great construction feats of

---

[27] Department of the Army, World War II Construction by U.S. Army Corps of Engineers, Office Chief of Engineers, Fact Sheet, ENGEX-P, March 26, 1970.

World War II, it contributed very little to the outcome of the war against Japan as favorable progress in other theaters caused a decline in the importance of the China-Burma-India Theater.[28]

The Navy's construction program increased at a rate that paralleled the Army's from mid-1940 to May 1945. The Department of the Navy was appropriated $8.6 billion plus obtaining $1.85 billion from other sources.[29] Base development on the islands was not accomplished without some difficulties. Planning had been incomplete and changes made in plans by higher headquarters, after construction began, complicated the construction effort. Construction supplies were not received in sufficient time to keep pace with requirements.[31] These and other problems undoubtedly helped necessitate the requirement for the Seabees to expand from a nucleus of 267 officers prior to World War II to a force of 12,000 officers and 238,000 men by August 1945, mostly employed in the Pacific.[32] The other side of the coin,

---

[28] Karl C. Dod, United States Army in World War II — The Corps of Engineers: The War Against Japan (Washington, D.C.: U.S. Government Printing Office, 1966), pp. 404-475.

[29] Department of the Navy, Building the Navy's Bases in World War II, Vol. I (Washington, D. C.: U.S. Government Printing Office), undated.

[30] Samuel D. Sturgis, Jr., Op. Cit., pp. 15-16.

[31] Karl C. Dod, Op. Cit., pp. 485-486.

[32] Edward H. Marsh II (Capt., U.S.N.), Advanced Base Planning, Industrial College of the Armed Forces, Washington, D.C., Thesis, January 21, 1969, p. 11.

however, is that many efficiencies were applied to enhance the construction effort. Civilian contractors were available to augment construction troops. As early as 1939, Congress authorized the use of Cost Plus Fixed Fee (CPFF) contractors for construction outside the United States, and at the same time authorized CPFF architect-engineer contracts for design.[33] By mid-1943 the War Department was back to the more normal and economical lump sum contracting.[34] Also in 1943, the Navy's Advanced Base Functional Components System was in its embryonic stage. The "new" concept of detailed, tailored base development planning was first used with great success in Britain and later at the islands of Bora Bora and Efate in the Pacific. The system revolved around the creation of four layouts, a major and minor naval base, and a major and minor airbase. It stressed flexibility and the use of functional components. By early 1943 the Chief of Naval Operations had approved an integrated program on this basis. Materials and equipment were identified, packaged and labeled. Depots handled some shipments; more than 200 types of activities were incorporated in the program. Procurement offices were staffed with construction experts to insure the logistic system worked.[35] This concept was rapidly incorporated in joint base development planning. In early 1944 Admiral Nimitz issued base development planning guidance to his subordinate Army, Navy, Air Force and Marine Commanders stressing the use of functional components in

---

[33] Ibid., p. 9.

[34] Ibid., p. 10.

[35] Ibid., pp. 11-14.

constructing forward bases.[36] That sound base development planning and management was required is evident when one considers that overseas bases, for all Services, necessitated expenditures over $13 billion. The combined total of the Services, worldwide, was well in excess of $36 billion as compared to a funded program of approximately $4 billion for Vietnam ($0.7 billion procurement monies for industrial plant expansion included).[37]

KOREAN CONFLICT

The Korean Conflict again placed numerous demands on the limited number of engineers available to build bridges, roads and airfields as well as accomplish their secondary mission as infantrymen during the critical early months of that war. At the outbreak of the Conflict essentially no time was available for construction planning. Major Walter C. Henderson relates:

> The 882nd Engineer Aviation Battalion was located on Okinawa in July 1950 . . . It was intimated that we would be away only sixty days . . . The building of K-2 (airstrip near Taegu, Korea) took more than a year. Admittedly it was a big job . . . But the constant changes of plans led us to fill where later we were to dig, and haul pierced-steel planking to places we were going to use only asphalt. Such changes make K-2 agonizingly slow and expensive. It also meant that jets could not come to K-2 when they

---

[36] U.S. Pacific Fleet and Pacific Ocean Areas, Planning and Preparation in Connection with the Establishment of Facilities at Advanced Bases, Central Pacific Area, Headquarters of the CINC, Letter, April 28, 1944.

[37] U.S. Department of Defense, Logistic Support in the Vietnam Era: Monograph 6, Construction, 19 October 1970, A Report by the Joint Logistics Review Board.

> were first needed. If the high-level planners had anticipated the final product, our project would have developed differently.[38]

Of the same era, Colonel Paschal N. Strong says "one should not be deceived by the accomplishment of the engineer mission in Korea by units fewer than those required by the manual".[39] He goes on to explain that the summer and fall of 1950 were unusually dry. This allowed rivers and streams to be crossed with little difficulty while normally a vast amount of bridge construction would have been required. This was fortunate as bridging and the additional engineers that would have been needed to support river crossings and routine bridge construction were not available. "The importance of advanced planning, both for supply and construction, was relearned."[40]

Apparently the lessons were learned in time, as the construction troops consumed materials at the rate of approximately $1 million per day during FY 1951 and FY 1952. This included field fortifications, particularly fighting and living bunkers constructed by the troops occupying them. The program was implemented by troops with minimal contractor assistance. This single Service alignment permitted centralized technical coordination of the program by General Mac Arthur's staff engineer without infringing on the prerogatives of the Services.

---

[38] John G. Westover (Capt., U.S.A.), Combat Support in Korea, (Washington: Combat Forces Press, 1955), pp. 38-41.

[39] Paschel N. Strong (Col., U.S.A.), "Engineers in Korea — Operation 'Shoestring'", Military Engineer, XLIII, No. 291, January-February 1951, 11-14.

[40] Ibid.

Elsewhere, the scope of the contract program expanded (as shown in Table 1) both in the Far East in support of combat operations and on the rest of the globe in support of collective security arrangements.[41]

TABLE 1

MILITARY CONSTRUCTION APPROPRIATIONS
(MILLIONS OF DOLLARS)

FISCAL YEAR	ARMY	NAVY	AIR FORCE	TOTAL
1951	500	500	1,230	2,230
1952	1,230	800	2,450	4,480
TOTAL	1,730	1,300	3,680	6,710

COLD WAR

Polarization of the East-West positions in the late 1940's and early 1950's ushered in the "Cold War" era. The continuous tensions engendered by the cold war resulted in the construction of strategic bases worldwide. This construction was done primarily through contract construction. Overseas contract construction had its peculiarities. Base construction rights had to be negotiated; unusual customs practices were applied to materials and equipment shipped into host countries; often the agreements would not permit experienced American construction companies to compete for the contracts; roads and railroads were often inadequate; shipping delays were normal; and the language problem was present.[42]

---

[41] Logistic Support in the Vietnam Era - - -, Op. Cit., pp. 10-14.

[42] L. J. Lincoln (Brig. Gen., U.S.A.), "Construction in a Cold War Theater of Operations", Army Information Digest, 13, No. 7, July 1958, 24.

THAILAND

A quiet, but steady, buildup of a logistic base in Thailand was started in 1962. "The U.S. is building a huge logistics system . . . to bolster the Thais in combating Communist guerillas in the northern provinces, and to provide facilities for American forces should they be needed to help fight the insurgents."[43] The construction projects include airbases, port facilities, roads, troop cantonments, and petroleum pipeline and storage systems. Thailand will be discussed in greater detail in Chapters II and III.

DOMINICAN REPUBLIC

Rapidly evolving events in the Dominican Republic culminated in the deployment of U.S. Armed Forces to that country on April 28, 1965. In early May, 1965 it became evident that U.S. Forces would be needed for a period ranging from several months to more than a year. Base development construction would be required to maintain the forces.[44]

The construction was to be done using peacetime, Military Construction, Army (MCA) procedures. Initial base development planning, designs, and estimates were completed and the necessary programing documents were hand carried to Washington, D.C. on July 6, 1965. On September 1, 1965 the Force Engineer was informed that the construction

---

[43] "A Major U.S. Bastion Springs Up in Thailand", Business Week, No. 1967, May 13, 1967, pp. 38-39.

[44] XVIII Airborne Corps, "The Stability Operation in the Dominican Republic", Military Engineering Considerations, Activities and Evaluations, Office of the Engineer, Fort Bragg, North Carolina, February 11, 1961, p. 31.

standards were considered too elaborate and guidance was provided on which to prepare and resubmit the programing documents.[45]

The second construction program was established in two phases. Phase I was to furnish tent camps, water and electricity using Operations and Maintenance, Army (O&MA) funds. Phase II allowed for the replacement of tentage with frame structures and the addition of waterborne sewage using MCA funds. The decision to accomplish construction, using O&MA and MCA funding, imposed a requirement for precise accounting procedures that proved to be particularly burdensome.[46]

The preparation of new project proposals was complicated by the lack of an adequate planning staff. The energies of the over-extended Engineer Section were split between base development planning and operational planning.[47]

An urgent requirement for knowledgeable design personnel existed throughout most of the Dominican Republic operation. Considerable local design was done to adapt standard designs to the tropical climate as well as substantial site adaptation because of geological and ground water conditions. The limitations of the local utilities systems also necessitated extensive local design.[48]

The base development plan was subjected to continuous revision during the construction phase. These changes evolved from revisions in

---

[45] Ibid., p. 34.

[46] Ibid., p. 52.

[47] Ibid., p. 36.

[48] Ibid., p. 82.

the stationing plans brought about by fluctuating force structures and demands by the Dominican Republic Provisional Government that the Inter-American Peace Force evacuate local military installations. Other revisions resulted from new concepts of operations as commanders changed.[49]

The base development planning staff consisted of the staff of the XVIII Airborne Corps Engineer, and initially, was organized to supervise engineer units in tactical operations. Little capability existed for design, estimating, cost accounting, real estate acquisition, and other activities associated with base development planning, construction, and provision of utilities services.

REPUBLIC OF VIETNAM

With President Johnson's July, 1965 decision to deploy a large military force to South Vietnam, an instant requirement was generated in this sparcely developed country for construction of a large logistic infrastructure.

Immediately before the mid-1965 buildup, only two Army and three Navy construction battalions were in South Vietnam. This shortage of military construction manpower was partially offset by the early mobilization of a large civilian construction force.[50]

---

[49] Ibid., p. 38.

[50] Donald F. Hartman (Maj., U.S.A.), "Construction Planning in the Theater of Operations", Thesis, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1968, pp. 2-11.

"For even more than the Pacific battles of World War II, the struggle for Vietnam — as Douglas Mac Arthur said of the earlier conflict — is 'an engineer's war'. Despite Herculean construction feats — the U.S. buildup has of necessity outpaced the logistical facilities needed to handle it".[51]

The planning and construction associated with the South Vietnam buildup is examined in greater detail in Chapters II and III.

KOREA - 1968

In late March, 1968 shortly after the "Pueblo" Incident and the "Bluehouse" assassination attempt on South Korea's President Park, a Department of the Army base development planning team was sent to Korea on temporary duty at the request of the Commander in Chief, U.S. Forces Korea and United Nations Command.

These officers all had broad experience in construction planning and execution, including engineering management in Vietnam at Army and Subordinate Unified Command levels. Their mission was to review existing plans, regulations and policies concerning base development to support existing operational and contingency plans, and to update, prepare, coordinate and publish all documents required to insure a complete, workable system for base development.[52] This planning process is further discussed in Chapters II and III.

---

[51] "Essayons!", Time Magazine, 87, No. 6, February 11, 1966, 25.

[52] James E. Lynch (Lt.Col., U.S.A.), "Base Development Planning ", Student Essay, U.S. Army War College, Carlisle Barracks, Pennsylvania, December 2, 1968, pp. 1-16.

SUMMARY

The preceding sketch serves two purposes; first the role that construction plays in a theater of operations is outlined; and secondly some of the problems that are encountered in planning, programing, and executing construction are portrayed.

PRESENT TRENDS

The ability to apply force quickly, effectively and efficiently on an intercontinental basis is a prime factor in applying national power. "Rapid reaction appears to be the only military solution to the world's growing instability, and of course swift reaction can be translated to mean adequate strategic lift."[53]

> It seems clear that we should accelerate a search for new strategic concepts for the overseas projection of U.S. power which will eliminate or reduce greatly the need for huge and costly support facilities such as were necessary in Vietnam - - - We need strategic choices other than waiting until ports can be secured, a military logistics infrastructure created, and surface lines of communication opened for the commitment of ground forces.[54]

C-5A GALAXY

Present developments are aimed at improving the deployment capability of the U.S. Forces, "when the huge C-5A aircraft is brought

---

[53]Robert M. Shoemaker (Lt.Col., U.S.A.), "Air Supported Strategic Army Corps", Military Review, XLIVV, No. 11, November 1967, 21.

[54]Ibid.

into the Military Airlift Command - - -, it will provide the Army with the capability to deploy combat units, to include both troops and their associated equipment, with minimum reaction times."[55]

The C-5A Galaxy is presently being tested by the largest joint military aircraft test force in history at Fort Bragg and Pope Air Force Base, North Carolina. The Army anticipates using the C-5A in the three strategic roles of deployment, buildup and resupply. The C-5A is designed to deliver 100,000 pounds well over 6,000 miles. Under wartime conditions, the Galaxy could go to maximum payload and carry 265,000 pounds almost 3,000 miles at over 500 miles per hour. This revises logistic timetables to read in hours, rather than days or weeks as with conventional surface transportation.

The C-5A is also a passenger carrier. In addition to its cargo, it can hold 83 combat-loaded troops in a special compartment above the cargo area; in lieu of cargo, total troop capacity rises to 345 men.[56]

FAST DEPLOYMENT LOGISTICS SHIP (FDLS) AND LIGHTER ABOARD SHIP (LASH) CONCEPTS

Other systems showing promise are the Fast Deployment Logistics Ship (FDLS) and Lighter Aboard Ship (LASH) Concepts. The FDLS concept

---

[55] "Getting There Fast With the Most", Army Digest, 23, No. 1, January 1968, 64.

[56] "C-5A, New Era in Mobility", Army Logistician, 2, No. 5, September-October 1970, 12-13.

calls for ships that could be preloaded with supplies and equipment and standby for deployment from the U.S. or that could cruise off the shore of a troubled area ready to react in conjunction with an air-lifted or amphibious combat force. These ships would permit roll-on/roll-off (RO/RO) loading and unloading; and would have the capability of being loaded and unloaded with helicopters, providing stern ramp discharge for organic amphibious vehicles, and allowing for ship to beach operations. The ships would be able to rapidly load or unload through established ports or in non-assault over-the-beach operations.[57]

Although not a part of approved doctrine, these ships could serve as a floating off shore logistics base thus "eliminating much of the large, expensive, and vulnerable logistical land bases like those in Vietnam".[58]

According to one writer, those improvements "could permit the streamlining of the logistic system to eliminate the need for much of the vast support infrastructure required for conventional surface operations".[59]

---

[57] "Getting There Fast With the Most", Op. Cit., p. 64.

[58] John A. Hoefling (Col., U.S.A.), "The Army and the Elusive FDL", Army, 18, No. 6, June 1968, 50.

[59] Robert H. Shoemaker, Op. Cit., p. 20.

And another author: "when these ships are in the inventory in sufficient quantity, reaction time will be greatly diminished and the requirement for destination port facilities almost totally eliminated".[60]

This concept for the Army is currently in disfavor with Congress, but a very similar system has been approved for the Navy to use in support of the Marines. If it is successful, it may provide the framework from which an Army support system can be developed and implemented. Numerous RO/RO ships are already available to the Army through commercial shippers.

The LASH concept calls for the mother ship to go to an anchorage, from which barges can be dispatched for loading and unloading. The first of these ships, the LASH Italia, was launched last July 11 and went into service in mid-November. There are currently three LASH ships, belonging to Prudential-Grace Lines, in operation, and two more will be available by the end of 1972.

The typical LASH ship can carry 73 lighters, each 31 by 61 feet and capable of carrying between 200 and 300 tons of cargo.[61] This concept shows great promise for Logistics Over the Shore (LOTS) operations during a contingency operation.

---

[60] Joseph J. Rochefort, Jr. (Lt.Col., U.S.A.), "Overseas Bases - Keystone of Strategic Mobility", Student Essay, U.S. Army War College, Carlisle Barracks, Pennsylvania, April 7, 1967.

[61] "Savannah Set to Build LASH Vessel Facility", Journal of Commerce, October 30, 1970, p. 24.

CONTAINERIZATION & CONTAINERSHIPS

Still another concept and program to enhance strategic mobility is that of containerships and containerization. Containerships are needed in emergencies to supplement commercial bottoms. They insure low manpower requirements, high production, order in the marshalling area and damage-free receipt at the depot. These ships differ from the FDLS in that they require relatively sophisticated port facilities for off-loading. Current containership operations under contract with Sea Land Corporation consist of hauling supplies between the United States and Okinawa. Sea Land ships carry up to 476 loaded trailers, and are targeted for an in port time of only 30 hours. The contract also provides for refrigeration service.

Also, DOD has contracted with the Sea Train Corporation to provide a specialized service for moving tracked and wheeled vehicles. A 35 to 50 ton deck mounted crane facilitates unloading. Although the Sea Trains are not actually roll-on/roll-off (RO/RO) ships, they have large unobstructed deck areas ideally suited for handling vehicles.[62]

Closely allied with containerships is the containerization program. The Army has been credited with pioneering efforts in containerization, having introduced its all steel CONEX (container express) container fleet over ten years ago. The CONEXs are approximately eight foot cubes used for consolidating the many small packages which

---

[62] Frank Besson, Jr., Op. Cit., p. 4.

characterize the supply system into unitized loads. In Vietnam, by December 31, 1966, 65,000 CONEXs had been shipped into the country - none had been returned. The Army continued to ship CONEXs at the rate of 5,000 per month through 1967 as the buildup progressed. It is convinced that without those containers, its logistic effort in Southeast Asia would not have been successful.[63]

Recently the Army Materiel Command elevated its containerization program to project management status in an effort to produce a totally integrated containerization system for Army-wide application. In FY 1970, the Army spent about $2 billion for transporting people and things. Closely related costs of packaging, preserving, in-transit losses, loading and unloading, and other elements drive the figure much higher and make it a prime target for cost reduction and improved efficiency.

A development and acquisition program for an Army-owned fleet of intermodal containers conforming to international standards (8' by 8' by 20') is in progress and the first production model from a procurement order of 6,700 is undergoing tests for type classification.

> As the Army sees it, a universal containerized logistical distribution system with associated standardized materials handling equipment and documentation procedures can pave the way to a throughput supply system. - - - Material would move from depots or factories direct to field units - - -.[64]

---

[63] *Ibid.*, pp. 2-3.

[64] "Containerization Program Wins Product Management Status", *Army Logistician*, 3, No. 1, January-February 1971, 15.

PREFABRICATED PORT FACILITIES

Other major logistic tools closely related to FDLS and containerized shipping are prefabricated port facilities, some of which have been used in Vietnam and some of which are under development. A workhorse in Vietnam has been the De Long pier, developed some years ago by the Army. A pier consists of two 80 by 300 foot barges which are towed to the objective area and quickly erected to provide an 80 by 600 foot facility designed to handle two deep draft ocean-going vessels. To emplace, caissons are dropped through holes in the barge and the barge is jacked out of the water with the caissons penetrating the bottom to a solid foundation. If deemed desirable, these piers can be jacked down and relocated.

The go-ahead was given, around Christmas 1965, to expand our pier construction program. Ten months later eight piers, or 16 new berths, were operating in Vietnam.[65] In addition to the above, on March 1, 1966 a small RMK-BRJ staff arrived at Poro Point on the west coast of Northern Luzon Island to develop a pre-fab facility for "instant piers". By May 1, 1966 the facility was in full swing and by August 17, 1966 a force of 904 Filipinos and 44 Americans had completed fabrication of 4,807 tons of structural steel into two 90 by 600 foot piers. Within two months both these piers were in service in Vietnam. The jacket-template construction design used requires 40 percent less material and permits a pier or wharf to be built in

---

[65]Frank S. Bessen, Jr., Op. Cit., p. 3.

a fraction of the time needed to construct a conventional free-standing design. Similar techniques were later used at Newport in Saigon and for bridges at Da Nang and Cam Ranh Bay.[65]

The Navy is studying effects of deployment and operation of a portable port system to be used for the resupply of military operations from D+15 days to D+12 months. The intent of the portable port concept is to permit the establishment of a new port in lieu of capturing an existing port, repairing or replacing demolished port facilities, or for those remote areas in which no adequate port facility exists. The portable port concept consists of a Baseline system and three alternate systems.

<u>Baseline system</u>. The Baseline system, which is preferred, contains a self-propelled floating pier linked to shore by an elevated sectional causeway. The self-propelled floating pier is called an Adapter Ship indicating that hardware will be provided on it, making it compatible with all types of ships, carrying all types of cargo. Cargo carriers may be trucks exclusively. The sectional causeway and other port elements are carried on the Adapter Ship.

<u>System A</u>. System A consists of two self-propelled floating piers (Adapter Ships). Amphibious vehicles would be berthed over a stern dry ramp; boats and lighters at berths alongside. The Adapter Ship is identical to the baseline system ship.

---

[66] C. S. Land, "Logistics Buildup in Vietnam Aided by 'Instant Piers' and U.S. Construction Combine", <u>Navy</u>, 11, No. 3, March 1968.

<u>System B</u>. System B consists of one elevated sectional pier linked to shore by an elevated causeway. The pier includes hardware which makes it compatible with all types of ships carrying all types of cargo. The pier and causeway sections are transportable on existing shipping.

<u>System C</u>. System C consists of a self-propelled floating pier (Adapter Ship) and a single elevated sectional pier linked to shore by an elevated sectional causeway. The pier and causeway would be transported by the Adapter Ship. The Adapter Ship is identical to the baseline system ship.

The idea is to provide a rapidly erectable port facility capable of off-loading at least 200 tons of cargo per hour in a variety of sea conditions. To make this system useable on a worldwide basis requires considerable additional research on a breakwater system.[67]

<u>AERIAL MAPPING TECHNIQUES AND AERIAL SENSORS FOR GATHERING ENGINEERING DATA</u>

One of the most striking actions in the sense of the amount of savings, both in time and money, experienced by the Navy in Vietnam was in changing the method of field surveying for highway construction. Normal practice was to send field survey teams to gather the data needed to design various highway segments. A young officer proposed the use of

---

[67]"Environmental Analysis Relative to Portable Port Operations", Research Report (Port, Hueneme, Calif: prepared by Ocean Service and Engineering, Inc. for the Naval Civil Engineering Laboratory), November 21, 1969, pp. I-1 to I-4.

photogrammetry techniques which produced excellent quality surveys yet cut surveying costs from $5,400 per kilometer to $3,100 per kilometer, for a total savings during FY 1969 and 1970 of $4,830,500.[68]

Generated by experiences in Korea and Southeast Asia, and from requirements of selection teams, the Air Force has established the goal of developing a system which can provide engineering site selection information on an all-weather, real time basis. While such a system is beyond the present state of the art, the system developed should provide the Air Force with a greatly improved contingency response capability in the near future. Just as with the other Services, the current Air Force posture in the world dictates a capability to establish airfield, communication and logistical sites. Present techniques require 4 to 8 weeks to complete and the deployment of 8 to 12 man teams, often in hostile areas. The following sensors have been tested under field conditions:

* Metric camera
* 70-mm reconnaissance cameras (Plus-X, infrared aero, color, color infrared)
* Infrared scanner (8 to 14μ) and A-scope radiometric temperature recordings
* Laser terrain profiler
* Gamma-ray spectrometer
* Earth penetrometers

As a result of these tests, the feasibility of using airborne remote sensors to determine engineering parameters for site selection

[68]H. J. Johnson (Rear Adm. , U.S.N.), "Management of War Zone Construction", Defense Management Journal, 5, No. 3, Summer 1969, 47.

has been demonstrated. The tests also determined that an optimum system for site selection should include both day and predawn operational techniques that can be incorporated into computer programs previously written for tactical airfield earthwork calculations. Further, if fully developed, the system could be capable of simultaneously collecting color photography, plus-x photography, infrared imagery (8 to 14u) with radio metric temperature data, and a laser-terrain-profile record, and would be capable of dropping penetrometers and recording penetration data.[69]

USE OF "INSTANT" SURFACING MATERIALS

In addition to the site selection tests, the Air Force has established the feasibility of using a sprayable, rapid-curing, light weight, low cost material system for use on a remote landing and takeoff site for Turbojet VTOL aircraft. To date, a suitable chlorinated polyester resin system has been developed, and an automatic catalyzing method for spraying resin and catalyst simultaneously has been demonstrated. Also, a method for predicting remote site size requirements has been established and an advance application system for preparing full-scale remote sites has been developed.

---

[69] "An Evaluation of Airborne Sensors for Site Selector Engineering Data Requirements", Research Report (Kirkland Air Force Base, New Mexico: prepared by Texas Instruments, Inc., Sandia Laboratories and the University of New Mexico for the Air Force Weapons Laboratory), April 1970, pp. 1-6.

Weight and cost comparisons have shown that the Rapid-Site preparation system compares favorably with reusable membrane and metal plank remote site concepts.[70]

PREFABRICATED, PRE-ENGINEERED, RELOCATABLE MODULAR STRUCTURES

This area is so vast that it can only be briefly mentioned here. It will be discussed in greater detail in subsequent Chapters. Suffice it to say that developments in this area will continue to substantially influence both peacetime and wartime construction in and out of the Services.

OPERATIONS RESEARCH-SYSTEMS ANALYSIS (ORSA) TECHNIQUES AND USE OF AUTOMATED DATA PROCESSING (ADP) IN BASE DEVELOPMENT PLANNING AND EXECUTION

This is another large area that can only be alluded to here. In recent years work has been done in these areas which portend significant improvement in base development planning and execution. Use of ADP will be examined in later Chapters.

NETWORK ANALYSIS IN EXECUTING BASE DEVELOPMENT CONSTRUCTION

Network analysis, the use of Program Evaluation and Review Techniques (PERT) and the Critical Path Method (CPM) to plan the most

---

[70] "Rapid Site Preparation Techniques for VTOL Aircraft", Parts II and III (Wright-Patterson Air Force Base, Ohio: Prepared by LTV Aerospace Corporation for the Air Force Aero Propulsion Laboratory), November 1968 and July 1969.

efficient use of men, money, materiel and facilities, is a management tool which has been widely used in commercial and peacetime military engineering operations. However, Theater of Operations management doctrine does not expound upon the use of this networking technique. Several years ago a doctrine was proposed which provides a means for developing a mission statement into a sequence and outline schedule of a planned operation. The doctrine prescribes that a graphical model be constructed to represent the sequence in which the project is to be executed. The model is also redrawn by orienting it to a horizontal time scale and adjusting task starting times so as to provide either the least costly, in terms of resources, or the least time consuming plan. A unit loading diagram is appended to the model to aid in project analysis. The proposed doctrine integrates the network modeling techniques with Army long-range planning sequences. The doctrine does not propose to stand alone as an all encompassing planning tool. Rather, it is meant to help the engineer in considering the diverse aspects of his total planning effort, and appears to be an area which will receive more emphasis in the future.

PRESTOCKAGE - FORWARD BASES AND CONVERTED LIBERTY SHIPS

Bases in strategic locations have played a big role in the past, and should continue to play a key role in the future in projecting the Nation's power. One author indicates that overseas bases, in conjunction with sea lift and air lift, provide strategic mobility. He contends that only by development and utilization of oversea bases

can the most efficient mix of airlift equipment be realized. Further, he states that theater bases must be small, simple, austere, and capable of rapid reaction, and contends that this can only be accomplished through prestockage available for rapid, responsive delivery to the user within the theater.[71]

In another essay, the same author puts forth a novel proposal to augment modern FDLS and containerships with some converted liberty ships transferred to DOD from the National Defense Reserve Fleet.

> "This type ship would provide the best storage system for an entire force base complex. Not only would all of the materials be consolidated and segregated, but - - - stored in a vehicle that could be towed to the point of utilization. It would not be necessary for these ships to be capable of sailing under their own power. - - - Nor even be desirable considering the cost of the major maintenance effort required to keep the ships ['] machinery in operable condition. - - - Ships would be nothing more than storage containers - - - utilized as floating depots during the construction period. Nothing - - - less expensive, or more practical. - - - Refinements should definitely be made - - - such as removing unnecessary machinery and superstructure. This would increase the load carrying capacity, provide space for helicopter pads and storage of a limited number of small landing craft, and making towing characteristics better. The ships could be prepositioned - - - reaction time would be even less."[72]

Another author proposes an extension of this concept whereby a seaborne logistical base lying twenty-five to one hundred and fifty

---

[71]Joseph J. Rochefort, Jr., Op. Cit., p. 17.

[72]Joseph J. Rochefort, Jr. (Lt. Col., U.S.A.), "Base Development-Success or Failure", Student Essay, U.S. Army War College, Carlisle Barracks, Pennsylvania, January 13, 1967, pp. 13-14.

miles offshore is established. This complex would consist of a number of ships; among these would be command and control ships, automatic data processing ships, communications ships, and supply-maintenance and hospital ships. The concept envisages the development of a new family of heavy lift vehicles (possibly air cushion vehicles), with capacities exceeding 50 tons, to facilitate movement of supplies, personnel and equipment between ship and shore. This concept might reduce the need for aircraft such as the C5-A and would represent a considerable change in current military thinking. At first blush this concept appears workable and deserving of future exploration. It could have some significant benefits: lower shipping costs per ton mile from CONUS and no repetitive costs for base construction are two. These pale by comparison when one considers the gain in capability of rapidly deploying and sustaining a large military force.[73]

CIVILIAN CONTRACTORS AND ARCHITECT-ENGINEERS IN THE THEATER OF OPERATIONS

Although extensive construction had been done by civilian contractors in support of U.S. military ventures, it was not until the Vietnam War that extensive use of civilian contractors and architect-engineers was made in the theater of operations.

It seems probable that there will be many wars in the future, and that the U.S. military will again be involved.

---

[73] Robert G. Shircliff (Col.,U.S.A.), "More Push - Less Pull", Student Thesis, U.S. Army War College, Carlisle Barracks, Pennsylvania, April 25, 1968, pp. 11-12.

> The military establishment at present and in the future, is a constabulary force which is continuously prepared to act/react in all levels over the entire range of conflict - - - nuclear, para-military, guerilla, counter-guerilla, and conventional. It is committed to use of minimum military force in achieving viable international relations rather than conventional 'victories' - - -. All times are 'wartime'."[74]

With the awesome destructive capability available to the world's major powers, the trend seems to be toward limited wars. It is highly likely that because of their nature, these wars will be fought in newly emerging and underdeveloped nations. Because of the limited infrastructure extent in these countries, U.S. construction effort will be required.

In reviewing the performance of the U.S. contractors in Vietnam from the viewpoint of Congress, the combat commanders, unified commanders, military analysts and news media, the conclusion reached is that the contractor was effective.[75] Thus it seems reasonable to consider using civilian contractors in future conflicts where they can be reasonably well protected. Selection of construction alternatives as to troop/contractor mix should only be made after all factors - military, economic, sociological, political and diplomatic - have been evaluated. To aid in determining the troop/contractor mix needed for optimum construction, cost effectiveness and responsiveness,

---

[74] Morris Janowitz, The Professional Soldier (New York: Macmillan Company, 1967), p. 48.

[75] John Mecklin, "Building by the Billions in Vietnam", Fortune (September 1966), p. 113 and "What You Should Know About Vietnam", Associated Press Close-to-the-News Book (New York: 1967), p. 30.

one researcher, using ORSA techniques, has developed a two step logic model which shows promise for providing valuable assistance in reaching decisions as to the composition and size of the construction forces.[76] Developments of this type are much needed and will certainly be further investigated and utilized in the future.

Technological Explosion in Weapons Systems and Ancillary Equipment. The major future trends discussed up to now all tended to be improvements to existing systems and procedures and promised to increase the speed, efficiency and effectiveness of construction planning and execution in the theater of operation. However, the current and anticipated explosion in weapons systems and ancillary equipment to support the country's modern forces in the field can only complicate the future planning and construction process. The need for more sophisticated facilities, such as longer and stronger intertheater airfields to handle the C5-A, air-conditioned and near-sterile avionics maintenance facilities, super-secure and air-conditioned communications facilities, sophisticated automatic data processing buildings, and super-hardened command/control facilities to guard against destruction from nuclear weapons, can only grow as technology progresses. This will mean additional headaches for the base developer in the future.

Implications of Social/Economic/Political Development in the U.S. Several authors have indicated that the U.S. soldier must become inured to austere conditions in the theater of operations.

---

[76] Albin W. Walton, Jr. (Capt., U.S.N.), "Contract Construction in Future Limited Wars", Student Thesis, Industrial College of the Armed Forces, Washington, D.C., February 24, 1968.

> The professional soldier of tomorrow must be prepared to cast off the burden of refrigerators, air-conditioners, stereo equipment, large complex logistic bases, and semi-permanent troop complexes from which tactical operations are mounted and to which troops return after an operation.[77]

"Bases are far too complex to be responsive, and far too expensive - - - it is extremely difficult for developing nations - - - to believe that bases so expensive and complex will not be retained by the U.S. after stability operations - - - requirements guidelines must be reduced to an absolute minimum."[78]

However, some forecasts for the 1970's, regarding public attitudes predict that:

> The notion that hard or unpleasant work must be tolerated because it is unavoidable is on the way out. Many companies may find they cannot pay the premimum that workers demand for unpleasant jobs.
>
> By 1980 the average income for workers will be $14,400. A rising share of income will go for travel, leisure, culture and self-improvement activities. The view will grow that leisure is a right rather than something to be earned.
>
> The public is developing a lower frustration tolerance for anything that impairs ability to work, live in decency as judged by [then] current economic standards, and to express oneself. There will be no tolerance of circumstances created by poverty, unemployment, sickness, reduced income at retirement and strikes.[79]

---

[77] Robert G. Shircliff, Op. Cit., p. 10.

[78] Joseph J. Rochefort, Jr., Op. Cit., pp. 9-10.

[79] Department of the Army, Some Implications of Social/Economic/Technological Forecasting to Military Construction, Working Paper, TR 68-012, Office of the Chief of Engineers: Washington, D.C., July 1, 1968, p. 7.

When an affluent society with attitudes as described above goes to war in the future, it is likely that the definitions of words such as "need", "minimum", "essential" and "austere" will be considerably different than they were in World War II or even today. This portends a trend toward more sophisticated facilities to handle an even greater number of "necessities" than the current logistic system.

From the foregoing it is evident that although future developments and technology may tend to reduce the overall requirements for base development construction, that same technology will probably insure that base development construction continues to be an important and early requirement. Supplies and equipment delivered by large cargo aircraft and improved logistic ships from advanced bases will still require air and water terminals, storage facilities, and land lines of communication to move materials to the consumer. Both quantitative and qualitative requirements are difficult to predict for future operations. However, it is certain that substantial requirements will continue to exist.

THE RESEARCH PROBLEM

The planning of a base construction program, using manual procedures, is a tedious, detailed and time consuming process. Usually time is limited in the crucial initial phases when a rapid deployment of military forces must be made. The capability to plan for and accomplish construction efficiently and effectively must keep pace with the rapid employment means, sophisticated equipment and scarcity of time likely in any future war.

Efficient and rapid execution of construction in a theater of operations requires that a sound, flexible construction program be evolved based upon prior planning and accurate construction estimates. To gain the most timely and efficient construction, a joint, integrated system of base development planning and execution needs to be implemented. As a minimum, this system should develop and incorporate:

- Joint construction standards
- Joint construction planning factors
- A joint functional component system making optimum use of pre-engineered and prefabricated, reusable, modular structures
- ADP systems in the planning/execution processes
- A process for submitting contingency construction requirements through a single joint commander within a theater of operation
- A system for programming and funding in terms of gross facility requirements
- An in-country construction control organization under the joint commander

Such a system should insure the following:

- Production of a program that is flexible and can accommodate changes as the actual situation develops
- Provision of a common method for planning, programming and executing construction in a theater of operations
- Emphasis on detailed planning for the construction of critical, high priority facilities or improvements
- Compatibility with both manual and computer assisted procedures

THE RESEARCH AND METHODOLOGY

The thesis deals with several aspects of the development of bases in the theater of operations:

Planning for construction in a theater of operations and maintenance of these plans

Execution of base development in the theater of operations, with particular emphasis on:

Construction standards

Use of pre-engineered, prefabricated, reusable, modular facilities

Standardization of functional components systems

Prestockage and prefunding in support of operations plans

Automatic Data Processing Systems for storage, processing and retrieval of base development planning information

Assumptions made with regard to the nature of the conflict are:

1. There has been no substantial change in the engineer "slice" of the troop basis, nor in its composition.

2. There is a partial mobilization in effect in the United States.

3. The war is off shore and involves a long line of communications.[80]

---

[80] All the routes, land,water, and air, which connect an operating military force with a base of operations and along which supplies and military forces move. U.S. Department of the Army, Dictionary of United States Army Terms, AR 310-25 (Washington, U.S. Government Printing Office, 1969), p. 252.

4. The theater of operations is in an under-developed nation with primitive logistics, transportation and communications facilities.

5. There is no clear differentiation between the combat and the communication zone. Both combat and logistics units are interspersed throughout the theater.

6. Some executive and statutory relief from normal peacetime requirements for funding and accountability for contractors has been granted.

These assumptions are considered valid and necessary to define the general atmosphere in which any conclusions or recommendations offered will apply. They essentially indicate a worst case situation, and as developed subsequently, are characteristic of our recent operations in Southeast Asia.

Chapter II is a discussion of recent construction planning and execution experiences in Asia, with emphasis on major problems encountered.

Chapter III is a review and examination of current and proposed base development doctrine and philosophy to determine what improvements have been made as a result of the Nation's recent experience in Asia, and what improvements still need implementation.

It examines existing base development planning and execution processes, construction standards and planning factors, functional component systems and prestocked, pre-engineered construction packages of the Services, and automatic data processing systems suitable for improving base development planning and execution.

Chapter IV analyzes Chapters I, II and III, and as a result of this examination, a recommended framework for establishing a joint system for integrated base development planning, programing and execution is synthesized and presented for further investigation and development.

Chapter V is a resume of the problem, current state of the art, the analysis, conclusions, recommendations and suggestions for further study.

Although numerous classified works were used as references, the research presented herein is confined to unclassified material.

Many of the references used were obtained from various military educational institutions, agencies, and DOD contractors around the country, through the services of the Defense Documentation Center and the Defense Logistics Studies Information Exchange. Numerous references were available in the Command and General Staff College Library or at the Institute of Combined Arms Studies, Fort Leavenworth.

The bibliography incorporated in the thesis is a selected bibliography, which, in addition to those sources directly referenced in the thesis, provides a lead to numerous other useful documents pertaining to base development in a theater of operations for researchers desiring more detailed information of a broader scope.

Chapter II

BASE DEVELOPMENT PLANNING AND EXECUTION IN ASIA (1965-1969)

The planning, organization and operation of the recent construction efforts in Asia have considerable application to the subject of this thesis. The purpose of this chapter is to examine procedures employed, with a view toward measuring their success in achieving the goal of timely, yet efficient and effective, construction. The research is directed primarily toward problem areas, since, inevitably, improvements are made by isolating what went wrong rather than by emphasizing what went right.

There is no attempt to overshadow or underrate the outstanding achievements of the planners and construction forces who produced numerous sophisticated support facilities in Vietnam, Thailand and Korea.

> When the decision was made - - - to deploy major U.S. Forces to Vietnam, our troops required a large complex of airfields, roads, ports, pipelines, logistical facilities, and bases to support tactical operations. These facilities had to be constructed immediately to accommodate the large numbers of men and tons of materials and equipment needed for combat.[1]

---

[1] William F. Cassidy (Lt. Gen., U.S.A.), "The Army's Engineers in Vietnam: A Record Unsurpassed", Army, 17, No. 10, October 1967, 62.

Also, it has been said that no essential tactical operation was ever delayed or impeded by lack of completed construction.[2] That this is so is an impressive tribute to the competance, dedication and fantastic hard work of the personnel involved. However, it should not, in the view of this author, be interpreted as evidence that the systems and procedures employed should be a model for similar future operations.

THE REPUBLIC OF VIETNAM (1965-1968)

The Vietnam conflict caused heavy reliance to be placed on construction. The undeveloped nature of Vietnam, with the almost total lack of initially available base facilities, especially with regard to ports and lines of communications, placed a premimum on speedy construction as a prerequisite to effective military actions and the logistics support of the deployed forces. The fixed-base, enclave nature and long duration of the war encouraged the development of a greater degree of permanency of construction than in past wars. The most striking aspect was the magnitude and scope of the task. The construction forces met the challenge with a military construction program that totaled $1.6 billion by mid-1968[3] and is presently in the neighborhood of $2 billion.

---

[2]C. M. Duke (Brig. Gen., U.S.A.), "Review of Construction Activities, RVN", Memorandum with Inclosure, for Brig. Gen. Raymond, Director of Construction, MACV, A.P.O. San Francisco 96491, n.d.

[3]U.S., Department of Defense, Logistic Support in the Vietnam Era: Monograph 6, Construction, A Report by the Joint Logistics Review Board, October 19, 1970, p. 189.

OVERVIEW

Some of the principal initial elements of the program were:

1. Cantonments for the entire force.

2. Six new deep draft ports, capable of receiving over 600,000 tons of cargo per month.

3. Eight thousand hospital beds.

4. Over 10 million square feet of covered storage.

5. Two and one half million cubic feet of refrigerated storage.

6. Twenty-six million cubic meters of dredging.

7. Eight jet airbases (including 12 new 10,000-foot runways) and 80 auxiliary airfields.

8. Three million barrels of POL storage.

9. Over 100 acres of ammunition storage pads.

10. Over 300,000 kw. of electrical power generating capacity.

11. Six million square feet of maintenance facilities to accommodate some 4,000 aircraft and 90,000 vehicles.

12. Rehabilitating some 1,800 miles of primary roads.[4]

This program was implemented with more than 40 battalions of nondivisional engineer[5] troops and a civilian contractor force that,

---

[4]Thomas D. Morris, "Upgrading the Effectiveness of Logistics Systems", Defense Management Journal, III, No. 4 (Fall 1967), 11; and Brig. Gen. D.A. Raymond, "A Brick and Mortar View of — Construction in South Vietnam", Defense Management Journal, III, No. 4 (Fall 1967), 17.

[5]Daniel A. Raymond (Brig. Gen., U.S.A.), "Observations of the Construction Program, RVN, 1 October 1965 - 1 June 1967" (U), Vietnam: Military Assistance Command, 1967, Tab I, p. 175. (CONFIDENTIAL)

at its peak, totaled over 51,000 people.[6] Figure 1 portrays how the funds through June 1968 were distributed.[7]

An exceptional feature of the construction program was the unusual reliance placed on civilian contractors to build in a war zone. Because of the need to react rapidly to demands for unforeseen construction and the constraints imposed by the limited number of engineer troop construction forces on active duty (a situation magnified by the fact that expected mobilization of National Guard and Reserve forces was not forthcoming), mobilization of a sizable civilian construction force was essential. The contractor forces made a major contribution to the construction effort, although these forces were gradually reduced as engineer construction units deployed and expanded to the extent that by the end of 1968, they outnumbered the contractor forces two to one.[8] Although the contractor effort was substantial, there seems to exist a misconception as to the relative scope of the contractor versus the troop contribution to the overall effort. In writings on the subject, it is common to encounter such statements as: "The main part of the construction job - - - had been given to a civilian consortium."[9] The error seems to be widespread, and revolves

[6] U.S. Congressional Record, 90th Cong., 1st Sess., 1967, CXIII, Pt. 71, p. 6421.

[7] U.S., Department of Defense, Logistic Support in Vietnam Era - - - , Op. Cit., p. 4.

[8] Ibid., p. 189.

[9] John Mecklin, "Building by the Billions in Vietnam", Fortune, LXXIV, No. 4 (September 1966), 113.

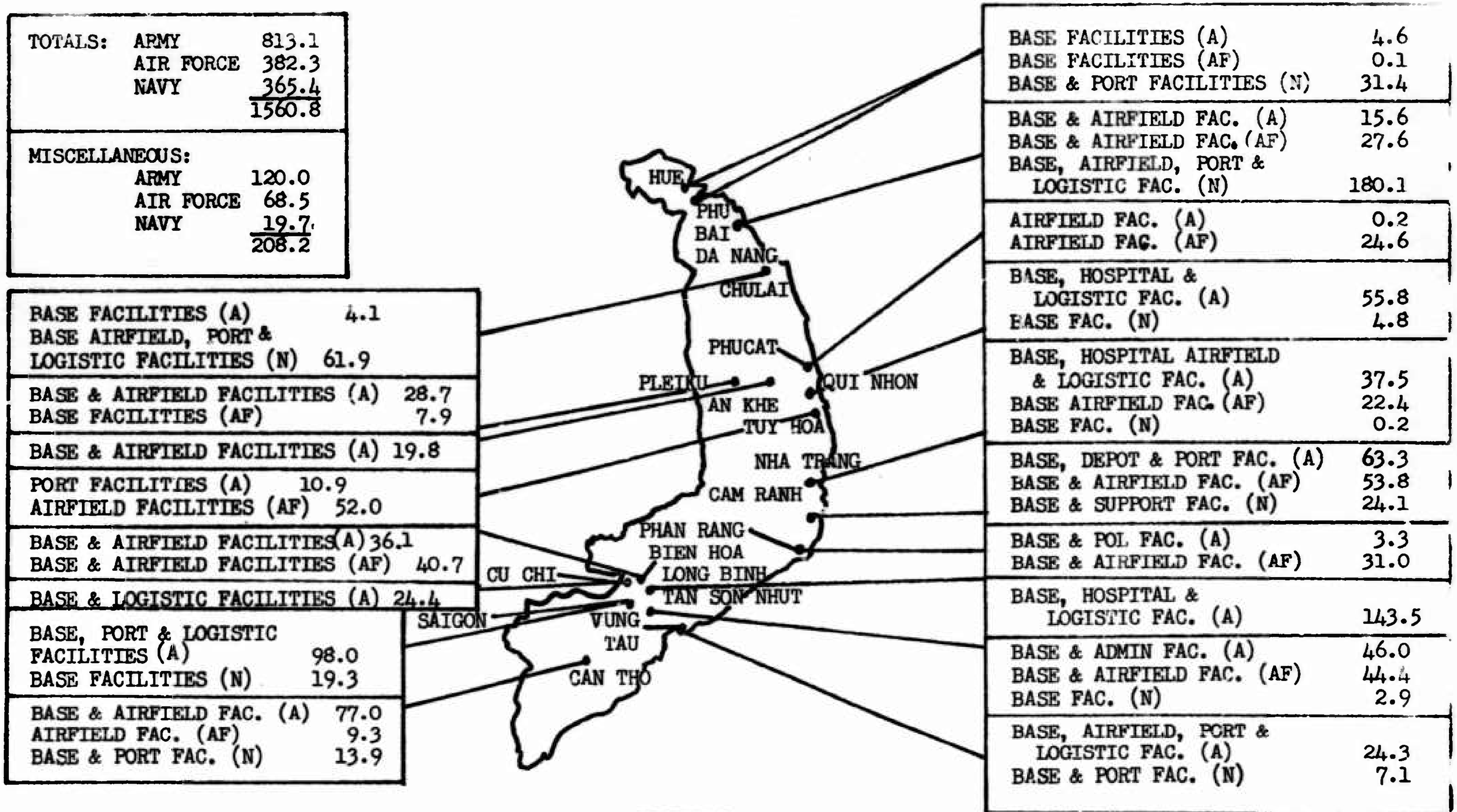


FIGURE 1

MILITARY CONSTRUCTION PROGRAMS, VIETNAM, JANUARY 1, 1965 THROUGH JUNE 30, 1968
(MILLIONS OF DOLLARS)

Source: Sharp-Westmoreland, Report on the War in Vietnam, 1968.

around the practice of equating the dollar cost of work to work in place. It is fed by such statements as: "To date, civilian contractor organizations have been assigned over two-thirds of the dollar value of the work to be accomplished."[10] This is accurate to a point, but fails to tell the entire story. Engineer troop construction is funded based solely on direct materials costs.[11] Thus, if $10,000 worth of materials are used in a facility, the construction unit is credited with accomplishing $10,000 worth of construction. However, for contract construction all elements of the job are funded — materials, freight, labor, overhead, equipment and profit.[12]

The major contractor in Vietnam — the joint venture of Raymond, Morrison-Knudson, Brown and Root, and J. A. Jones (RMK-BRJ) — indicates that only approximately 33 percent of the cost of a project is represented by materials and freight.[13] Assuming his freight costs are similar to those of Utah, Martin, and Day, Thailand contractors, the direct material costs are only 25 percent.[14] This difference in funding represents a disadvantage to the contractor when cost comparisons are made with troop units for the same item of construction. At the same time, it serves to grossly inflate the portion of

---

[10] Raymond, "A Brick and Mortar View of . . .", Op. Cit., p. 18.

[11] U.S. Department of Defense, Construction Directives, Construction Bulletin 415-2-2, Military Assistance Command, Vietnam, March 29, 1966, p. 1.

[12] Raymond, "Observations. . .", Op. Cit., Tab M, p. 180.

[13] Ibid.

[14] Ibid.

the overall program attributed to the contractor. The same facility discussed above might represent a $40,000 credit to the contractor's work in place. The using organization, however, would only have one more building. If this reasoning applied across the board, it would mean that the contractor, while assigned two-thirds of the monies, was only responsible for one-third of the actual work in place. A number of variables could tend to change the result one way or the other, but it is a reasonable conclusion that the troop program represents a significant part of the construction effort in Vietnam.

PLANNING AND READINESS

Base development planning prior to and during the buildup in Vietnam is reviewed with special emphasis on areas in which there is potential for improvement during future contingencies.

Importance of Base Development Planning. The Vietnam war gives a lucid example of the difficulties of planning for a future contingency and the way requirements may change. At the same time, it is evident that the responsiveness and effectiveness of the total construction program in a contingency is dependent on a complete and reasonable logistic plan. To the extent that such a plan can be developed in advance, the role of the planner becomes clear - - - to develop plans that provide essential information concerning the command so as to define, in specific terms, the quantity and types of facilities required in the area of operations under study. The importance of this is shown in the following statement of military engineers involved in or reviewing the Vietnam construction experiences.

A base development plan must provide, on a timely basis, data as to construction material requirements, construction unit and effort requirements, requirements for mobilization and Pre-D-day action, provisions for maximum use of local resources, maximum joint use of planned facilities by all Services in an area, phased requirements for facilities weighed against construction capabilities, and uniform standards for all Services in an area."[15]

In order to provide a smooth, orderly program of facilities construction, thorough logistic planning should have been accomplished 18 to 24 months before the Vietnam buildup began.[16]

It is essential that contingency planning for future trouble spots include adequate definition of requirements and development of supporting base facility plans. This is particularly imperative in view of the long lead time required to provide such facilities.[17]

Planning. Under a Joint Chiefs of Staff/Unified Command planning process, the Commander in Chief, Pacific (CINCPAC) had produced a plan for contingencies in Vietnam prior to the 1965 buildup. Commanders under his operational control had prepared supporting plans. The following are highlights of the planning as it existed in 1965.

a. Phase I (Alert) was initiated by CINCPAC in 1964. In this phase the Service component commanders were directed to accelerate planning, programming and training to insure logistics preparedness.

---

[15] Military Engineering in Support of U.S. Army 1967-1975 (U), Vol. II, Part 2, February 1968, U.S. Army Military Engineering Study Group, p. C-11-A-2 (SECRET), as reported in, Logistics Support in the Vietnam War . . ., Op. Cit., p. 21.

[16] Ibid., Vol. III, p. C-11-2 (SECRET).

[17] Raymond, "Observations . . .", Op. Cit., p. 10.

b. The Commander, U.S. Military Assistance Command, Vietnam (COMUSMACV), was tasked with planning and conducting joint operations on the mainland. Service component commanders were directed to provide responsive logistic support for their units.

c. COMUSMACV was charged with coordination and control of logistic support in Vietnam, including establishment of priorities. COMUSMACV's plan specified construction priorities as:

Airfields
Main Supply Routes
Railroads
Port Facilities
Logistic Base and Support Facilities[18]

CINCPAC's plan stated that facilities to be constructed would be austere and only essential operational and support facilities of the greatest urgency would be included in the construction program. For the specified force levels (Phase II called for 64,000 troops), the basic plan and all supporting plans were adequate so far as base development was concerned.

The U.S. Army, Ryukyu Islands (USARYIS) was tasked to accomplish the base development planning for Army Forces designated for deployment to the theater of operations in Phase II. A comprehensive plan resulted, incorporating austere construction standards. It stressed

---

[18] U.S., Department of Defense, Logistic Support in the Vietnam Era - - -, Op. Cit., pp. 21-22.

a number of factors bearing on the adequacy of the plan. These included the need for additional engineer construction forces, the requirement to expand the plan prior to commitment of additional forces above those planned, the necessity for certain military and Department of State actions related to real estate acquisition, and the need to preposition construction materials in the theater.

The Navy's base development planning highlighted the lack of logistic support capabilities, the extremely limited transportation capabilities, the need to use small coastal ports and shallow-draft lighterage, and the possibility of expanding Saigon Port. However, the planning did not encompass plans ashore such as would be required with the unforeseen prolonged deployment of the Marines and naval logistical responsibilities in the I Corps Tactical Zone (CTZ) of Vietnam.

The Air Force planning for Phase II was adequate and visualized the use of planned and already constructed Military Assistance Program (MAP) facilities.[19]

In a number of reviews subsequent to the publication of the CINCPAC base development plan, the deficiencies in logistic support capabilities were identified. This resulted in the submission in early 1965 of appraisals to the Secretary of Defense identifying problem areas, including those in the USARYIS base development plan. It is important to note that there is no evidence that the recognized requirement

---

[19] _Ibid._, pp. 22-23.

to preposition construction materials in the theater was translated into specific requirements for bulk construction materials or, more importantly, that key items with comparatively long procurement lead times, such as landing mat, piers, hospitals, and large generators, were requisitioned.

Although CINCPAC planning was basically sound, the specifics of the Service plans were to be almost nullified because the actual buildup was so different from that planned. Thus, there remained little more than a catalog of existing assets, climatic data, topographic information, and meaningless deficiencies in construction effort. The desirability of a base development plan applicable to a wide variety of situations is readily apparent. Action had been initiated to identify construction deficiencies, but, mostly because of the rapidly changing course of events, corrective action had not been initiated in the most important areas.[20]

At the start of the build-up the base development planning capabilities of the Army and Navy in Vietnam were not substantial. Prior to arrival of the 18th Engineer Brigade in September 1965, the Army's main planning capability existed in the small engineer section of Headquarters, 1st Logistical Command. The Navy's capability was concentrated in the Public Works Department of the Saigon Support Activity, which was, at the start of 1965, engaged in minor construction projects. Capabilities in I CTZ were enhanced by the arrival of the

---

[20] _Ibid._, p. 23.

III Marine Expeditionary Force (MEF) and the 30th Naval Construction Regiment in May 1965.[21] The III MEF staff was quickly augmented by a small planning group from the Pacific Division of the Bureau of Yards and Docks.[22]

Initially, the Air Force had a small civil engineer directorate in the Air Division, with the major portions of the engineer functions being accomplished at Thirteenth Air Force in the Phillipine Islands and Pacific Air Force (PACAF) Headquarters in Hawaii. The 2nd Air Division eventually grew into Seventh Air Force with a full civil engineer staff, and further capability became available when a regional civil engineer office was established in Saigon in 1965 to effect coordination with the U.S. Navy Officer in Charge of Construction, Republic of Vietnam (OICC, RVN).[23] The early MACV capability was limited to the Engineer Division in J-4, later redesignated the MACV Director of Construction.[24]

One critical element, and the starting point of the planning sequence, was lacking — a statement of the force level and composition to be supported. If the force level is accurately known, the facilities

---

[21] Ibid.

[22] Director, Pacific Division, Yards and Docks, U.S. Department of the Army, Report to CINCPAC, July 30, 1965, as reported in Logistic Support in the Vietnam Era - - -, Op. Cit., p. 23.

[23] U.S. Department of Defense, Logistic Support in the Vietnam Era . . ., Op. Cit., pp. 23-24.

[24] Raymond, "Observations . . .", Op. Cit., pp. 8-9.

required can be envisaged. A projection then determines the funds and effort needed to support the construction program. Following this, the planner sites facilities in areas and specific installations,[25] and time-phases the construction in order of priorities.

What, then, made the determination of facility requirements and the construction of facilities so complicated? Factors appearing worthy of discussion are: the deployment program that evolved, in-country redeployments, the types of operations, and inadequate engineer intelligence.

a. Deployment Programs: The major decisions establishing the force level for Southeast Asia (SEA) were based on a series of events that peaked in late 1964 and early 1965. The strategy of graduated response led to a step-by-step buildup of U.S. forces in Vietnam. These forces totaled 81,000 in July 1965 and reached 184,000 by December of that year. They were to peak at 542,000 in February 1969. This concept was the foundation for six separate deployment programs, which were implemented by a series of incremental troop movements of lesser size. The cumulative buildup of forces to support the six programs took place between June 1965 and June 1969. Each incremental increase in the force level generated another cycle of the planning, funding and construction process. Rarely was there lead time to develop the logistic support needed.[26] A former logistics commander who participated in the initial stages of the conflict aptly describes conditions:

---

[25] U.S., Department of Defense, Logistic Support in the Vietnam Era . . ., Op. Cit., p. 24.

[26] Ibid.

- - - There were only three airfields in all of South Vietnam that were capable of handling jet aircraft.

Two years ago Saigon had the only significant deep water port facility south of the 17th parallel.

Such rail and road networks that once existed had long since been interdicted and in many instances destroyed.

In less that twenty months, Army strength in Vietnam jumped from about 15,000 to 300,000 and the Army was supporting more troops and moving more supplies in South Vietnam than it did in 1952 during the peak period of the Korean Conflict.[27]

b. Redeployments within Vietnam: Another factor which substantially impacted on construction requirements in-country was the redeployment of troops within Vietnam. Some major examples are:

1. The shifting of troops northward, caused by the increased pressure that the enemy was exerting on units below the Demilitarized Zone (DMZ). Initially, Marine units were shifted from the Da Nang area to the border to counter invasion by a North Vietnamese Army (NVA) division. On April 12, 1967, Task Force Oregon was formed as a provisional division by shifting Army units to southern I CTZ. During early 1968, particularly during Tet, enemy activity in northern I CTZ reached a feverish pitch. Because of this, in March 1968 a provisional corps (later designated XXIV Corps) was formed. It had operational control of all units located from the DMZ south to the Hai Van pass, including several Army units moved up from II and III CTZ.

2. In mid-January 1967, major elements of the 9th Infantry Division shifted from III CTZ to establish a joint Army-Navy base in

---

[27]Charles W. Eifler (Maj.Gen., U.S.A.), "Management by Conflict", Army, March 1968, pp. 64-65.

the Mekong Delta for the Mobile Riverine Force. The base, called Dong Tam, was a 600-acre island created among inundated rice paddies by dredging fill material from the Mekong River (fill alone took in excess of six months to emplace and cost over $10 million).[28]

3. Operation MOOSE (Move Out of Saigon Expeditiously) resulted from COMUS MACV's concern with the growing numbers of U.S. forces in Saigon and his decision to move as many units and installations out of metropolitan Saigon as was feasible. Key ingredients in Operation MOOSE were the relocation of MACV Headquarters to Tan Son Nhut (TSN) Airbase; relocation of Headquarters, USARV and Headquarters, 1st Logistical Command, along with various USARV combat support brigade headquarters, to the Long Binh area; the dispersion of numerous 7th Air Force elements from TSN to other airbases; and relocation of elements of the Naval Support Activity (NSA) from Saigon to Nha Be. These displacements generated additional requirements at a time when available construction capability was already overcommitted.[29]

c. Types of Operations: The widespread nature of the insurgency and the inadequate land lines of communication produced large enclaves with island-like logistics. Because of the generally stable situation, a more permanent type of construction was demanded than is normally envisaged. Special types of operations peculiar to the

---

[28] Department of Defense, <u>Logistic Support in the Vietnam Era . . .</u>, <u>Op. Cit.</u>, p. 24; also, author's personal experience.

[29] <u>Ibid</u>., p. 25; also, author's personal experience.

Vietnam conflict contributed to unexpected demands for construction at scattered locations. Brigade and division base camps, plus numerous forward deployment airfields, dotted the countryside in checkerboard fashion. Also, special Naval operations, such as MARKET TIME and GAME WARDEN, which were designed to inhibit and frustrate enemy logistics and maneuver activities by denying him use of the open seas and inland waterways, and the Mobile Riverine Force, a joint Army-Navy Force designed to make use of the waterways of the Delta in offensive operations, had a significant effort on construction resources.[30]

The U.S. buildup at Nha Be typified the manner in which GAME WARDEN construction requirements increased in 1966. In May, the facilities consisted of a tent city and a pontoon pier within a small compound. A total of 157 sailors with 10-river patrol boats, four-mine sweepers and four-small landing craft was supported. In, June, when the force expanded to 3,000 men with 20-river patrol boats and 12-minesweepers, a large covered lighter had to be provided as an interim afloat berthing and repair facility. A major river base would eventually be constructed for the GAME WARDEN forces and the NSA headquarters, and would necessitate a major dredging project and the construction of numerous facilities.[31]

---

[30] Ibid., p. 25

[31] U.S., Department of the Navy, Operation of the Service Force, U.S. Pacific Fleet, FY-67 (U), Commander, Service Forces, U.S. Pacific Fleet, n.d., pp. 5-12 (CONFIDENTIAL), as reported in Logistic Support in the Vietnam Era . . ., Op. Cit., p. 25.

d. Engineer Intelligence: The Joint Chiefs of Staff Special Military Construction Study Group concluded that "currently, intelligence in support of base development plans is provided on an ad hoc basis to meet stated requirements. There is no programmed effort in the intelligence community to meet specified schedules for production and maintenance of intelligence in support of base development planning."[32]

In particular, the need for current hydrographic surveys was highlighted:

> For the first 18 months of the program, dredging requirements vis-a-vis time exceeded capability - - - for the most part, hydrographic data for design of channels and ports was non-existent or outdated. Due to the long lead time involved in mobilizing dredge plant in RVN, it became necessary to contract for the plant concurrently with the initiation of hydrographic survey and designing. The fit of the fleet to the jobs was necessarily based on incomplete data. In most cases it was satisfactory. In others, such as the inability of the dredge Bess to pump the abrasive material at Dong Ba Thin, it was not satisfactory.[33]

The need extended to operations as well as port development: ". . . In order to provide logistic support from the sea it is obviously necessary to have good, and current information on harbor facilities, beach gradients, tidal data, meteorological data, etc."[34] The monsoon season, heavy rains and seas created frequent changes caused by shifting sands and silting, which intensified the need for frequent surveys.

---

[32]U.S., Joint Chiefs of Staff, Report by the Special Military Construction Study Group (U), Special Military Construction Study Group: Washington, D.C., July 17, 1968, p. 35, (SECRET).

[33]Raymond,"Observations. . .",Op. Cit., p. 53.

[34]Written comments of Vice Admiral Blackburn, Commander, Seventh Fleet in 1965, to Vice Admiral Hooper, April 1969, as reported in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 26.

Functional Components. Major changes in requirements in a rapidly changing war are inevitable. Planning must strive to minimize the time and effort in meeting these requirements. This emphasizes the importance of designs in being to meet the more common requirements, and the avoidance of specially tailored designs whenever feasible. The experiences of the Vietnam conflict highlight the importance of functional component systems.

a. Navy System. At the start of the buildup the Navy had in existance a system that had been developed in World War II to meet the needs of the island hopping campaigns and the requirements for a wide variety of bases. This was the Advanced Base Functional Component (ABFC) system for the establishment of naval advanced bases. In this system a functional component contains the personnel and equipment for the performance of a task, including a 30-to 90-day supply of consumables. It has provisions for tailoring and integrating components into an overall base plan. Any type of naval base can be established through this system. The system also has provisions for providing, training and echeloning personnel; providing tools and materials; and performing maintenance. It also enumerates shipping weights and cubes. During the Vietnam Conflict, materials might or might not be in stock. In either case, the components represented preplanning in that the materials were identified and listed. A specific standby procedure to obtain, assemble and ship component materials was available. Designs and instructions for assembly were also provided.[35]

---

[35]Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., pp. 26-33.

b. Army System. The system used at the start of the War was the Engineer Functional Components System (EFCS), which had been developed in its present form early in the Korean Conflict, and updated in 1960. The EFCS was the basic tool for construction of facilities in the theater of operations, and it was used to supply two-thirds of the construction materials for Army troops. Unlike the Navy system, the EFCS provides for construction of facilities only. It does not include deployment of troops and their equipment as an integrated part of the system. The basic difference in the Army and Navy systems reflected their different philosophies - - the Army intended to live under canvas until a long-range requirement developed, whereas the Navy did not envision employment ashore and construction of facilities until a long range requirement existed.

c. Air Force System. The Air Force began development of the Bare Base Mobility Concept in 1966 to furnish mission associated material packages for shortrange requirements. This concept recognizes the need for more permanent and sophisticated facilities only after a deliberate determination has been made that there will be a protracted need for deployed air units in the theater of operations. Maximum retrievability and functional utility are features of this system. The facilities are of fixed size since they are tailored to support a specific unit, and are maintained in a fly away status to minimize response time lags.

d. Functional Components Systems in Vietnam. The Special Military Construction Study Group found that, although the functional

components (FC) systems were used in planning, experiences in Vietnam and inferences drawn from interviews conducted by the group showed a lack of:

> . . . inclusion of modern equipment and pre-engineered/prefabricated elements in FC designs, commensurate with modern technology, . . . general acceptance by the user of facilities specified by FC system, . . . adequate coverage by the systems to meet new and evolving operational needs of the Services, . . . a key to translate facilities expressed in FC terms into DOD category codes, . . . cross referencing between Service systems, . . . commonality among the Services of criteria, standards, and designs.[36]

Although the Services had different bases for maintaining stocks of war readiness materiel (WRM) the fact that some stocks were on hand and could be used immediately added to the troop and contractor capabilities to meet RVN construction requirements. The WRM program's responsiveness, readiness, and usefulness were degraded by:

> . . . insufficient quantities of materials held in stock to make complete functional component assemblies, and to provide specific items, and . . . overage condition (to the point of obsolescence in some cases) of many items which resulted in non-usability, reduced utility and installation/construction/maintenance difficulties.[37]

Pre-engineered Structures. The construction in RVN was partially a process of converting raw materials into facilities. The U.S. construction industry long ago conceived pre-engineering and prefabrication techniques, because standardization offered the opportunity to minimize design requirements, and ease of erection could reduce labor

---

[36]U. S. Joint Chiefs of Staff, Special Study Group, Op. Cit., p. 46.

[37]Ibid., p. 29.

force needs. Although labor unions have slowed adaption of these techniques in the civilian sector, the Services do not have such a constraint in the theater of operations.

From a military viewpoint, a prefabrication package can be deployed at least as rapidly as individual construction materials, and relocatability can reduce additional material requirements for support of in-country redeployments. The potential shortage of construction personnel that could result from a decision to forego national mobilization in a future Vietnam type contingency indicates that greater use should be made of the construction industry's newest technology.

Pre-engineered and prefabricated commercial type facilities were used extensively in RVN to provide shops, warehouses and hangers in logistics and airbase complexes. They were also used for administrative buildings in the larger headquarters complexes such as MACV and USARV. Their use in RVN was restricted by the availability of military supply agency stocks and the production capacity of the U.S. industrial base.

Standards. The question of construction standards in Vietnam was raised as a problem even before major unit deployment. Brigadier General Osmanski, MACV J-4 between March 30, 1962 and February 28, 1965, identified such standards as an unresolved problem in his tour completion report, dated February 28, 1965.[38]

---

[38] U.S., Department of Defense, Command History 1964 (U), Saigon, Vietnam: United States Military Assistance Command, Vietnam, p. 150 (TOP SECRET), as reported in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 36.

As noted previously, CINCPAC had specified austerity in his contingency plan. On February 8, 1965, the Deputy Assistant Secretary of Defense (Properties and Installations) requested that the Department of the Navy (as executive agency for construction in Vietnam), "assume responsibility for design and construction standardization in this geographical area and apply this principle to the maximum extent possible." The cooperation and assistance of the Air Force and Army were solicited. The reasons outlined were:

> Construction in South Vietnam should be held to minimum essentials consistent with functional needs for a limited tenure . . . Many opportunities for economies should be available by using similar design for repetitive, common items . . . for reasons of economy and to expedite the general design and construction effort."

The use of completed designs of one Service was recommended "in cases where requirements are compatible and advantages in reduced construction costs and time may be achieved." It was "not intended that standardization of facilities should delay the initiation of construction already scheduled against critical completion dates", nor was it "intended that design funds be uneconomically applied simply to obtain uniformity without realizing other practical benefits."[39]

On May 27, 1965, Secretary of Defense Robert McNamara signed letters to each of the Service secretaries transmitting the military construction approvals contained in Public Law 89-18. Each of those letters contained the following:

---

[39]U.S., Department of Defense, Design and Construction Standards for Facilities in Vietnam Under the Military Construction Program, Memorandum, Office of the Assistant Secretary of Defense (Projects and Installations), February 8, 1965, as reported in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 36.

> . . . In general, designs will be held to an austere minimum consistent with functional requirements, and the quality of facilities should be reasonably uniform for all Services, particularly where more than one Service is located at the same installation. Following this principle, costs for similar facilities constructed by the same methods at the same location are expected to be comparable between Services.[40]

Following these guidelines, on June 4, 1965, COMUSMACV published Directive Number 415-1, which assigned responsibility for development of construction standards to the Deputy Officer in Charge of Construction, SEA, and gave the first published guidance on standards. In February 1966, responsibility for the establishment of standards was transferred to the Director of Construction. The revision to Directive 415-1 of October 20, 1966 prescribed three cantonment standards "based on expected tenure of occupancy". Those standards, which, with minor modifications, were to prevail to the present, were:

> Field: Cantonments for forces whose activities are such that they may be characterized as essentially transient.
>
> Intermediate: Cantonments for forces subject to move at infrequent intervals. Anticipated duration of occupancy: 24-48 months.
>
> Temporary: Cantonments for forces not expected to move in the foreseeable future.[41]

The regulation prescribed, in an annex, what these standards were for various type facilities and allowed for exceptions when approved by COMUSMACV. Examples of these standards as extracted from the annex are shown in Table 2.

---

[40] As reported in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 37.

[41] Ibid., p. 37. Also, author's experience.

Table 2

Standards For Facilities

FACILITY	TEMPORARY	INTERMEDIATE	FIELD
Troop Housing	Austere wood buildings: 1-&-2 story barracks	Austere wood huts; tents with wood frames & floors	Austere wood huts; Class IV tents with wood frames & floors
Mess Halls	Pre-engineered metal or wood building	Pre-engineered metal or wood building	Wood buildings; tents
Dispensary	Pre-engineered metal or wood building	Pre-engineered metal or wood building	Wood building; tents
Electricity	Central power and distribution	Nontactical generators	Nontactical generators; TOE generators
Water Supply	Piped water distribution	Point supply with limited distribution	Point supply
Sewage	Waterborne	Consolidated treatment; burn-out latrines	Burn-out latrines
Roads	Paved	Stabilized	Dirt

Source: Raymond, "Observations . . .", 1967.

Brigadier General Raymond had the following to say regarding standards:

> At the initiation of the buildup, construction was underway to a limited scale on both U.S. and MAP support facilities which were permanent in nature. Obviously these standards could not be continued . . . Accordingly, standards were developed to minimize cost and construction time. Three factors played a dominant role in standards determination: The mission of the unit for which the facilities were to be provided; the permanency of a unit in a given location; and the philosophy of the Service. It became quite apparent at the outset that there could be no single standard for all purposes and that reconciliation of Service philosophies would be difficult."[42]

General Raymond further remarked:

> Initial attempts at reconciliation of standards within RVN sought to establish a common denominator which would have had the effect of lowering standards of the Air Force and Navy and raising those of the Army and Marine Corps. As might be expected, this step was only partially successful.[43]

He concluded:

> Common standards of construction must be established prior to the initiation of a construction program, with strong controls, particularly through funding levels, starting in the programming phase.[44]

The problem of establishing standards in RVN was complicated by variations in philosophies on the subject as well as the peculiarities of the conflict. Both the Army and Marine ground combat units have been traditionally acclimated to operating with minimal facilities.

---

[42] Raymond, "Observations. . .", Op. Cit., pp. 12-13.

[43] Ibid.

[44] Ibid., p. 145.

With the development of the sophisticated aircraft and weaponry now in the Services' inventories, it became necessary to concurrently develop more sophisticated support equipment. Consequently, the fixed bases have become sophisticated industrial facilities constructed to necessarily high environmental standards. The components and materials ordered by the Army and Navy utilizing their respective FC systems were, to put it charitably, "quaint", as the systems had not been regularly updated. Facilities were more austere than might otherwise have been the case. This experience emphasizes the interrelationship between standards and functional component systems.

A totally unanticipated rise in cantonment standards evolved, because the war in RVN was unique, at least since the winning of the West, in the way combat operations were conducted from a series of base camps and enclaves. This resulted in a higher standard of living than was possible in any other war in the Nation's history. This rise in standards had a major influence on construction requirements. The almost complete elimination of B rations and the large-scale use of frozen foods, fresh fruits and vegetables, and dairy products, increased the need for cold storage facilities that nullified existing planning factors.

To preclude reduction of individual efficiency by the tropical environment, air conditioning was justified for specific areas, such as administrative and planning areas, certain medical facilities, and billets for night-flying pilots. This requirement was not initially

envisaged, and much time elapsed before it was accepted, followed by a still larger procurement lead time to get this type of equipment in-country.

Coupled with this, the exchange system marketed a variety of household goods never before available in a theater of operations. This was alledgedly done to combat inflation in RVN. In addition, many items not available from the exchange system in-country could be mail-ordered. Consequently, television sets, air-conditioners, electric perculators, hot plates, small refrigerators, toasters, and electric blankets became commonplace. These items generated unprecedented demands for electrical power and required unplanned procurement of electrical generators and additional design or redesign of power distribution systems.[45]

General Raymond observed that the standards problem had been "a vexing one," especially regarding cantonments. He further ruminated that in-theater application of standards must seek equity among the Services to the maximum extent feasible. To this end he suggested:

> All fixed installations, e.g., depots, ports, hospitals, airbases, etc., should be authorized the same standards.
>
> All collocated activities of two or more Services should be authorized the same standards, regardless of other considerations.
>
> The 'field' standard should be considered only an interim one with upgrading to at least 'intermediate' and a continuing authorization on a permissive basis by the theater commander.

---

[45] U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 39.

Funding should be authorized on the basis of only the two highest standards. Each Service should be authorized funds based on a theater commander approved split, percentage wise, between these standards. Each Service request for funds should be based on the same authorized unit cost applied to the theater commander authorized split. In the final analysis the most effective control of standards is through funds allocated.[46]

The Special Military Construction Study Group observed that, except for those cases where problems became too large to be ignored, the overall question of standards was not addressed by the Secretary of Defense, the Joint Chiefs of Staff, or the Services. As already partially observed, normal guidance from the foregoing consisted of terms such as "minimum essential" and "austere", both subject to varying interpretations.

The study group concluded:

Construction standards for planning and/or execution of a construction program in support of contingencies are not uniform between the Services and/or unified commands.

Variations in construction standards in Vietnam resulted in wasted resources and morale problems.

Uniform standards for all Service and unified commands can be developed by the Joint Chiefs of Staff in close correlation with a joint functional component system and an expanded DOD category code.

Uniform standards must be used in the planning and execution of construction in support of contingencies, if problems are to be based only on operational requirements.

Standards should be the minimum essential to meet operational requirements and all Services should strive to achieve, but not to exceed, prescribed standards.[47]

---

[46]Raymond, "Observations . . .", Op. Cit., p. 114.

[47]U.S., Joint Chiefs of Staff, ... Special . . . Study Group, Op. Cit., pp. 70-71.

EXECUTION AND IMPLEMENTATION

This section reviews the construction capability existing in the Republic of Vietnam (RVN) at the start of the buildup in 1968. Next, the way in which the total construction force was mobilized is examined. Prime attention is devoted to the mobilization of the engineer troop construction units and of the principal civilian construction contractor in Vietnam (RMK-BRJ), but an analysis is also made of the size and composition of the total construction force, including numerous other available construction resources. Then, the employment of those sources is studied, with particular attention to the manner in which the troop-contractor efforts were coordinated.

Initial Capability. In October 1963, it was anticipated that the bulk of the U.S. task in RVN would be completed by the end of 1965. Therefore there was a cutback in building of a logistic base in-country. However, by mid-1964 the tactical situation had deteriorated and presidential approval was given on July 21, 1964 to start increasing military strength.[48] This was the first in a series of decisions that was to reverse the downward trend and bring about the massive construction program that later evolved in RVN.

There were no construction troops in Vietnam in 1964; consequently, in November 1964 COMUSMACV requested an engineer group to complement the contractor forces. This request was pending on January 1, 1965,

---

[48] W. C. Westmoreland (Gen., U.S.A.), and U. S. G. Sharp (Adm., U.S.N.), Report on the War in Vietnam, Washington, D.C.: U.S. Government Printing Office, June 30, 1968, p. 99.

and although both the Army and Navy were considering sending engineer units to Vietnam, the year started without any force deployment plans.

As DOD contract construction agent in RVN, the Navy's Bureau of Yards and Docks - later redesignated the Naval Facilities Engineering Command (NAVFACENGCOM) - had, in 1962, mobilized the combine of RMK. Because of the downward trend in construction the combine had been phased down to the point where the monthly work in place (WIP) rate was only $0.9 million from a previous peak of $2 million.[49]

As discussed previously, contingency planning anticipated that the bulk of the work would be done by engineer troops. However, because of the lack of available troop units, it soon became apparent that a contractor force would have to be kept in operation. Although no project funding was yet at hand, CPFF (cost-plus-fixed-fee) contractor demobilization was halted; the existent capability in U.S. supervisors, staffs and logistics support operations was retained as a gamble that the program would materialize.[50]

Funds arrived in September, 1964 and by January 1, 1965, the monthly WIP rate was over $2.0 million. Of major significance from the long range standpoint was the fact that two increments of $1.0

---

[49]U.S.,Department of the Navy, Management Actions, 1967, Naval Facilities Engineering Command: Washington, D.C., Item D.1. As reported in, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 96.

[50]U.S., Department of the Navy, RVN Construction Program (U), Memorandum, Director, Pacific Division, Bureau of Yards and Docks, December 22, 1964 (SECRET). As reported in, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 86.

million each of equipment had been ordered, a Saigon materials stockpile had been authorized, and the contractor supply system from San Bruno, California, to Saigon was operational.[51]

The goal was to expand the contractor's 1965 WIP rate to $4-5 million per month. Even so, this would only get the most critical work done. The rest would have to be deferred or be done by troops and Vietnamese contractors. In addition, planners learned in late 1964 of a possibility of an even longer construction program later in FY 1965. It was becoming increasingly apparent that further force buildup would require deployment of construction troops, plus further increases in contractor forces, if facilities were to be constructed in a timely, responsive manner.[52]

Development and Deployment of Additional Capabilities. In a combat situation, construction needs can be translated into such factors as battalion-month or man-day equivalents for accomplishment. Because combat construction had historically been funded from operations monies, the construction planner had not previously been constrained by funding procedures except when funds represented a depletable resource. Two aspects of construction in Vietnam changed this. The first was the use, for the first time in a theater of operation, of a civilian contractor to accomplish a major slice of the construction.

---

[51] U.S., Department of the Navy, Sequence of Significant Events, Southeast Asia Construction, Item 80, "Chronology of Actions to Enhance Capability", Naval Facilities Engineering Command: Washington, D. C., July 20, 1965. Reported in, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 96.

[52] Management Actions, Op. Cit., in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 96.

The second was the decision by the Secretary of Defense that approval of construction requirements was to be centralized in his office and that military construction (MILCON) programing and funding procedures would be used.[53] Thus, in RVN facilities requirements were first programed in dollars, which were then converted to materials, equipment, work force, and overhead. For this reason, to understand the problem of recognition of requirements, especially in the early buildup stages, the funding viewpoint must be addressed.

At the start of 1965, each Service was engaged in a world wide reprograming action to make funds available for RVN under the applicable sections of the FY 65 MILCON authorization — Public Law 88-390.[54] By March, the slowness of the reprograming process led the Secretary of the Navy to alter the procedures and allow for early procurements of long lead time items.[55] However, the Secretary of Defense did not change his basic position on use of MILCON procedures. In late 1965, after a COMUSMACV briefing in Saigon, he stressed that

---

[53]U.S., Department of Defense, Funding of Construction Cost of U.S. Buildup in Vietnam (U), Secretary of Defense; Memorandum, Washington, D. C., September 12, 1964 (SECRET); in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 97.

[54]U.S., Department of the Navy, History of SEA Construction Program, Naval Facilities Engineering Command: Washington, D. C., September 7, 1965.

[55]U.S., Department of the Navy, Readiness Actions for Southeast Asia (U), Secretary of the Navy, Washington, D. C., Memorandum, March 31, 1965 (SECRET), as described in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 97.

Congress should not be expected to give a "blank check", and that, to get Congressional authorization, "reasonably defined projects" would be required.[56]

As a result, budget requests, on an "as required" basis, were submitted to Congress. This in turn resulted in incremental funding of the RVN construction program, which, per se, would not necessarily have been unresponsive to needs, since the force buildup, dictated by a policy of "graduated response", was itself incremental. The problem was that the deliberate procedures resulted in considerable delays between CINCPAC's statements of requirements and the funding of these requirements. Since actual construction requires time to accomplish after funds are made available, the funding procedures contributed to the lag between expression of a need and the construction of facilities.[57] Figure 2 shows the relationships of the buildup of the force level, funding and actual WIP.

Early in 1965, NAVFACENGCOM began a rapid expansion of design capability by employing additional A-E firms. By March, plans were formulated to establish an independent construction office under OICC, RVN; this was done by 1 July. This resulted in substantial buildup of the staff, the expansion of the RMK joint venture to RMK-BRJ, the introduction of more viable management systems and procedures, attempts

---

[56] U.S., Department of Defense, Command History (U), Annex A, Commander in Chief, Pacific, 1965, p. 126 (SECRET); Ibid.

[57] U.S., Department of the Navy, Southeast Asia Coordinating Group Note 11010, Naval Facilities Engineering Command: Washington, D. C., April 13, 1967, Volume 11, p. 1.

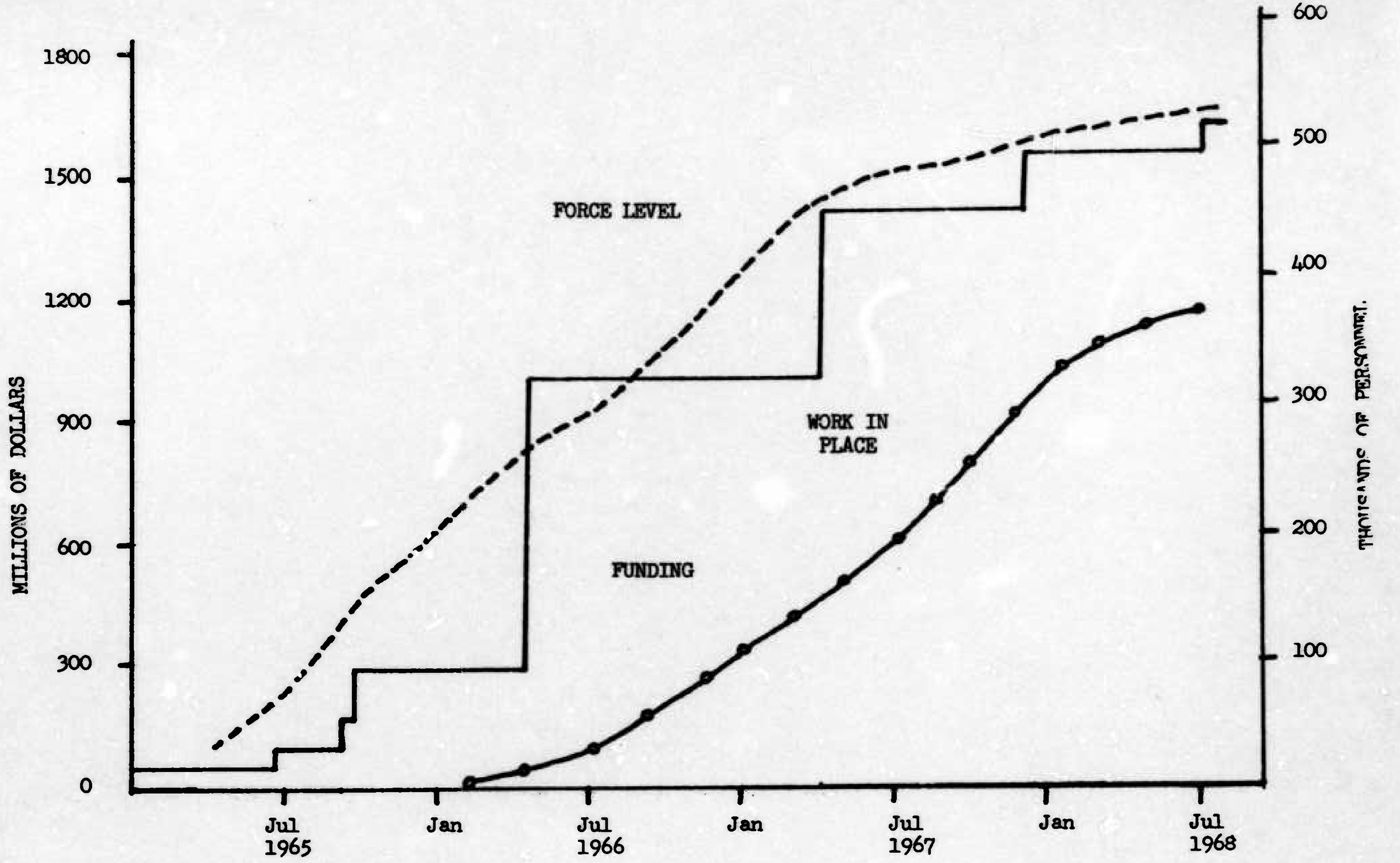


FIGURE 2

VIETNAM FORCE BUILDUP VS. MILCON FUNDING AND WORK IN PLACE

Source: U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., 1970.

to reduce lead times, and the revision of the CPFF contract to a cost-plus-award-fee (CPAF) contract. Major portions of the 1965 program were assigned to the OICC, RVN for contract construction. The OICC worked closely with the contractor to develop a construction plan. Because equipment and most materials had to be shipped from CONUS and additional workers recruited from third countries, mobilization decisions had to be made 4-6 months before on-site construction could be started on each newly funded program.

Although the true measure of progress in a construction program is facilities built, the OICC and contractor used WIP as a rough indication of progress. Initially, the OICC, RVN unilaterally established the target dates for WIP based on professional judgement as to the level of mobilization required. With the activation of the MACV Construction Directorate in February 1966, OICC stopped formulating unilateral targets for WIP. However, from the FY 66 Supplement (FY 66 S) and all subsequent programs, the construction plan, as previously, was prepared by OICC and RMK-BRJ to develop a WIP rate. The target rate for WIP then became a commitment that was a basis for analyses and planning by MACV and the Office of the Secretary of Defense (OSD) of capabilities versus requirements.[58]

On March 31, 1965, the Secretary of the Navy advised the Secretary of Defense that the Navy, as DOD construction agent in SEA,

---

[58] Ibid., pp. 1-4.

could forecast: "an approaching flood of construction projects we are not at present prepared to meet . . . if construction funds were available immediately, it would take 4 to 6 months to get the necessary materials and equipment into the area". The Secretary of the Navy recommended $13 million in funding, for planning and design, a material stockpile, and critical equipment.[59] OSD responded quickly on the funding for design; a decision on April 15, 1965 established this as a Service responsibility. The advance procurement funding program was not, however, addressed as rapidly. Therefore, NAVFACENGCOM unilaterally used a portion of the FY 65 Supplement (FY 65 S) funds to establish a materials stockpile near Saigon. Materials worth $20 million were ordered despite the deficiency in funds.[60]

On September 22, 1965, almost 6 months after the initial request by the Secretary of the Navy, OSD authorized use of 40 per cent of the FY 66 Amendment (FY 66 A) Program funds to support advance procurement of equipment and materials for the contemplated FY 66

---

[59] U.S., Department of the Navy, Readiness Actions for Southeast Asia (U), Secretary of the Navy, Washington, D. C., Memorandum, March 31, 1965 (SECRET), as designated in, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 103.

[60] U.S., Department of the Navy, Requirements for the Projected FY 1966 Military Construction, Republic of Vietnam (U), Naval Facilities Engineering Command, Washington, D. C., Point Paper, June 16, 1965 (SECRET), Ibid.

Supplement (FY 66 S) Program. Mr. McNamara regarded this as an unusual use of MILCON funds and indicated this was an emergency matter and was not to be considered a continuing or stock fund arrangement.[61] Following the visit by the Secretary of Defense to Saigon in November 1965, the contemplated FY 66 S Program escalated from about $350 to $700 million; approximately $600 million of this was to be for contract work.[62] Also, on his own initiative, in January 1966 the Secretary of Defense provided advance procurement authority for the FY 66 S Program, almost three months before appropriations were made available. He authorized $200 million in Navy Stock Fund (NSF) obligated authority to be used; however, the Services were required to reimburse the NSF.[63]

The two fold increase in the FY 66 S Program which occurred after Secretary McNamara's visit to Saigon caught OICC and RMK-BRJ without a plan, as the vastly increased program was to be completed by the same date, July 1967. As a result of this increase, the program was not completely defined; for example, the program included

---

[61]U.S., Department of Defense, Advance Procurement of Construction Materials and Construction in South Vietnam (U), Memorandum, Secretary of Defense: Washington, D.C., September 22, 1965, (SECRET); as reported in Logistics Support in the Vietnam Era . . ., Ibid.

[62]U.S., Department of the Navy, Analysis of Construction Capability Required in Vietnam (U), Memorandum, Naval Facilities Engineering Command: Washington, D.C., March 15, 1966, (CONFIDENTIAL), Ibid.

[63]Financing of Long Lead Time Construction Supplies and Materials in Vietnam (U), Memorandum, Secretary of Defense: Washington, D.C., January 8, 1966, (CONFIDENTIAL), Ibid.

airfields at locations identified only as bases X, Y and Z. Construction mobilization decisions had to be made in the absence of definite plans in order to start advance procurement actions. In May, 1965, the contractor recognized that logistics would be the key to construction effectiveness and that deep-draft pier capability would be a bottleneck. Accordingly, after OICC approval, a trans-shipment point was established in the Phillipines. This was followed by the creation of a series of in-country subdepots from which materials and equipment could be dispersed directly to individual project sites. The logistic system established by the contractor proved to be so responsive that it was used occasionally to support troop construction until such action was precluded by OSD.[64]

Mobilization of the workforce was the most sensitive task. First estimates - later somewhat reduced - indicated a need for 62,000 personnel, plus the management for the regional offices. The effectiveness and responsiveness of the recruiting system is reflected in the fact that the workforce expanded from about 2,500 in July 1964 to a peak of over 51,000 in July 1966. One of the most serious problems was the shortage of skilled indigenous workers, which required importation of third-country nationals (TCN's). In addition, a formal on-the-job training program for about ten percent of the Vietnamese employed by RMK-BRJ was vigorously pursued. This not only assisted the contractor in mobilizing skilled workers, but made a substantial contribution to the Vietnamese economy and infrastructure.

---

[64] Analysis of Construction Capability . . . Vietnam, Op. Cit.

The decision not to issue a general callup of Reserve and National Guard units imposed a major constraint on the deployment of engineer construction troops to RVN. Planning had relied on the augmentation of the active duty forces by these reserves, and the start of the buildup in RVN found the Army and Navy without adequate construction forces on active duty to support the combat forces planned for deployment to RVN.[65] In late 1964, COMUSMACV and CINCPAC had recommended deployment of an Army engineer group as part of the planned Army logistical command. The need was stressed as particularly great in the combat environment of remote areas and where the requirement for minor projects was time sensitive to rapidly changing operational needs. However, following a visit to RVN and Thailand in February 1965, an OSD task force concluded that this was unnecessary and recommended against the deployment of the engineer group at that time. The task force stated that the contractor had virtually unlimited capacity for expansion and was capable of working in combat areas.[66] The course that the overall construction program would take remained undecided for several months. Many schemes were considered, but not implemented; the control of the program remained the responsibility of the small MACV engineering staff. Primarily because of

---

[65] U.S., Joint Chiefs of Staff, _. . . Special . . . Study Group_, _Op. Cit._, p. 41.

[66] U.S., Joint Chiefs of Staff (Director of Logistics), _Logistic Improvement in South Vietnam_ (U), Memorandum, February 5, 1965 (SECRET), _Logistics Support in the Vietnam Era . . ._, _Op. Cit._, p. 107.

inadequate staffing, control was exercised passively until the staff was substantially expanded concurrent with the initiation of the Directorate of Construction in February 1966.[67]

Despite these circumstances, the Army and Navy did plan work for engineer troops. Also, on April 20, 1965, the Joint Chiefs of Staff forwarded a proposed FY 65-66 base development plan, which stated that Army and Navy forces could be employed on projects requiring 113 and 21 battalion-months of effort, respectively.[68] Formal approval for deployment of the first Army-Navy construction unit was obtained in April-May 1965. The first naval mobile construction battalion (NMCB) arrived at Chu Lai in May to begin work on an expeditionary airfield. By June, two more NMCBs had arrived. The first Army engineer group headquarters (35th Engrs) and two engineer construction battalions arrived at Cam Ranh Bay in June 1965 to begin work on a deep water port, logistic complex, and airfield. These battalions were the beginning of the U.S. troop construction forces that were ultimately to grow to a total of 27-Army, 12-Navy and 5-Air Force nondivisional battalions and squadrons with an aggregate strength of about 40,000, augmented by a sizeable local labor force.

In reviewing the planning for 1965 and 1966 engineer troop deployments, it is important to note that overall troop requirements

---

[67] Raymond, "Observations . . .", Op. Cit., Ch. V., p. 17.

[68] U.S., Joint Chiefs of Staff, Southeast Asia Construction Plan (U), April 25, 1965 (SECRET), mentioned in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 109.

were uncertain due to the "graduated response" policy espoused by the Administration, the decision not to call up the Reserves had been made, and there was indecision as to the need for construction troops as opposed to further expansion of the contractor export. As of December 1965, OSD troop planning reflected a requirement for 22 1/3 construction battalions as of the end of 1965 and for 46 1/3 battalions as of the end of 1966. This proved unrealistic, however, in light of the Services' capabilities to deploy units. By February 1966, OSD planning had been revised to incorporate the inability of the Services to deploy units as originally planned. The new plan provided for an increase in contractor effort to compensate for the troop shortfall. The new plan appeared realistic, but COMUSMACV soon stated that it too would result in a substantial shortfall, since the plan was based on assumed troop capabilities which were unrealistic.[69] Table 3 compares the planned and actual buildup of engineer troop units through June 1967. If the Air Force employments are not included, the actual deployments closely paralleled the February 1966 plan. The drastic increase in June 1967 reflects the fact that the Army, faced with an inadequate active duty base of engineer units and the nonavailability of reserves, found it essential to organize, equip, and train completely new units for deployment. This took about one year. Although it was satisfactory in terms of trained personnel, some units were deployed with equipment shortages.

---

[69] U.S., Department of Defense, RVN Construction Requirements, Message 278950Z, Commander, U.S. Military Assistance Command, Vietnam, February 27, 1966 (CONFIDENTIAL).

Table 3

BUILDUP OF NONDIVISIONAL ENGINEER

TROOP UNITS IN VIETNAM*

QUARTER ENDING	ARMY CONST	ARMY CMBT	NMCB	AFCE SQDN	TOTAL	OSD PLANS Dec 65	Feb 66
31 Mar 65	0	0	0	0	0	-	-
30 Jun 65	2	0	3	0	5	-	-
30 Sep 65	5	2	4	0	11	-	-
31 Dec 65	5	5	4	0	14	22 1/3	16
31 Mar 66	5	7	5	2	19	-	16
30 Jun 66	5	7	7	2	21	24	19
30 Sep 66	7	7	8	4	26	-	25
31 Dec 66	8	11	8	5	32	46 1/3	27
31 Mar 67	8	11	8	5	32	-	27
30 Jun 67	15	11	10	5	41	46 1/3	29

*Excludes Marine Corps Fleet Marine Battalions assigned to IIIMAF

Source: Raymond, "Observations . . .", 1967.

Although the nondivisional engineer troops and RMK-BRJ did most of the construction in RVN, they were by no means the only resources used. The contributions made by others should not be underestimated either from the aspect of amount of construction accomplished or of the impact on user satisfaction. Other resources accomplished construction amounting to 20 per cent of the MILCON program and provided a responsive means for many commanders to fill some of their most critical needs. A summary of the major construction resources is shown in Table 4.

Facilities maintenance forces, although primarily intended for maintenance/repair of completed facilities, were also used for alterations and minor new construction funded from operations and maintenance (O&M) funds. This new work is limited by DOD directive to $25,000 in total funded cost for each project.[70] Because of the tremendous need for new facilities early in the conflict, the facilities maintenance effort was employed mostly for new work. However, by FY 68 the emphasis had shifted, and all Services were expending a majority of their facilities maintenance efforts on maintenance and repair. An estimate of the magnitude of the other funded construction accomplished can be made on the fact that the Army's facilities maintenance contractor, Pacific Architects and Engineers (PA&E) spent over 25 percent of its effort on new construction in FY 68, over half in FY 67 and nearly all of its effort in previous years. The total O&M

---

[70]U.S., Department of Defense, Operations and Maintenance Facilities Program - - Minor Construction Programming, Review and Reporting Procedures, Directive 4270.24, June 30, 1961.

Table 4

SUMMARY OF CONSTRUCTION RESOURCES

	ARMY	NAVY	AIR FORCE	OTHER
TROOPS	a. Two engineer brigades consisting of 13 combat battalions and 15 construction battalions. (Peak strength about 30,100)	a. A Seabee brigade consisting of 12 NMCBs. (Peak strength about 10,000)	a. Five heavy repair (RED HORSE) squadrons. (Peak strength about 2,000)	a. Self-help — widely used by all Services.
	b. Various engineer utility detachments with the primary missions of facilities maintenance. (Peak strength about 1,450)	b. Public works forces assigned to the Naval Support Activities at Da Nang and Saigon. (Peak strength about 2,500)	b. Base Civil Engineering forces at each of the Air Force bases to accomplish facilities maintenance. (Peak strength about 4,500)	b. Divisional Army and Marine Corps engineer battalions and Marine Force battalions assigned to IIIMAF. (Not included in troop strengths of the three other Services)
			c. Prime BEEF teams — small teams of Air Force officers and men deployed to RVN on a temporary duty basis to accomplish specific construction projects. (O&M funded)	

Table 4 (Con't)

	ARMY	NAVY	AIR FORCE	OTHER
CONTRACTORS	a. Pacific Architects and Engineers (PA&E) — the Army's facilities maintenance contractor. (Peak strength about 24,000)	a. RMK-BRJ — the main construction contractor in RVN operating under the supervision of the Navy Officer in Charge of Construction (OICC). (Peak strength about 51,000)	a. Walter Kiddee — turnkey contractor for Tuy Hoa Air Base.	a. Various turnkey contractors for communications facilities — included Page, RCA, and Philco.
	b. Vinnel Corporation — contractor for installation, operation, and maintenance of electrical systems — primarily T-2 tankers.	b. Philco-Ford — contractor providing a skilled third-country national (TCN) labor force to the public works activities. This force together with the Seabees organic to the public works activities and a force of local nationals made up the Navy's facilities maintenance work force. (Peak strength about 6,000)		b. Local contracting authority — primarily funded with AIK funds — used extensively by the Army and the Navy to construct advisor facilities.
	c. DeLong Corporation — installation and rehabilitation of DeLong Piers.			

Source: Raymond, "Observations . . .", 1967

funded construction for all Services is probably well over $200 million.[71]

Self-help was also widely used, particularly for troop cantonments. These projects were normally MILCON funded and covered by a construction directive. However, in the earlier part of the buildup, much unauthorized self-help work was done to provide essential facilities by the most expeditious means. This practice continued into the more stable period and eventually resulted in much diversion of effort and materials from authorized work. The problem was sufficiently serious that the Deputy Commanding General, U.S. Army, Vietnam (USARV) sent a personal letter, in the autumn of 1967, to each of his subordinate commanders directing that positive actions be taken to reduce unauthorized construction.[72]

Contracts awarded under Local Contracting Authority were usually funded with Assistance-in-Kind (AIK) funds and were mainly for work in support of the MACV advisor detachments. The contracts were generally small, ranging up to $100,000. Also, RMK-BRJ expended $20 million in AIK funds for all the Services between FY 63 and FY 68. Another source of funds to finance a limited amount of construction was nonappropriated funds.

---

[71]U.S., Office of the Secretary of Defense, Real Property Maintenance Council Meeting, Memorandum for Record, January 31, 1968, Enclosure 1, also, Real Property Maintenance Council Meeting, June 28, 1966, Enclosure 3.

[72]U.S., Department of Defense, Logistic Support in the Vietnam Era . . ., Op. Cit., p. 114.

In reviewing the relationships of all the construction resources, it is apparent that the overall joint and Service control relationships and responsibilities regarding those organizations were complex, and in some cases, not well defined. The intent to centralize control of construction is lucidly stated in the charter of the MACV Director of Construction (MACDC), who was charged to "exercise direct supervision, and directive authority over all DOD construction commands and agencies, both military and civilian, in the RVN except to those construction/engineer units organic to or assigned to major combat units".[73] Although the control exercised by MACDC was extensive and effective, it was not as absolute as the charter might indicate. Engineer troop units, for example, often had overriding missions for operational support that preempted their availability for MILCON. The degree to which they were available was controlled by Service component commanders, not by MACDC. On the other hand, engineer units theoretically could not undertake work without a MACDC directive, and the rapidity with which Service construction needs were met depended largely on the engineer resources they made available to do the work. As another example, the various turnkey contractors, e.g., Vinnell, DeLong, Walter Kidde, and the communications facilities contractors, were under virtually complete control of the Service or Defense agency

---

[73]U.S., Joint Chiefs of Staff, Construction Management in Vietnam, Memorandum SM 39-66, January 14, 1966.

concerned. The Services' facilities maintenance forces used for construction were also under the control of the component commanders.[74]

Utilization of Troop and Contractor Forces. Troop and contractor construction forces were not mobilized as a result of a carefully planned optimum troop-contractor mix calculated to best meet construction requirements. It was, instead, a series of actions/reactions to formulate and make the best use of the construction effort that could be made available. The extensive use of RMK-BRJ throughout the conflict and the particularly heavy early reliance on the contractor were not a result of a decision that this was or was not the best approach. Rather, it was recognition that the contractor was an existing, viable commodity, that the initial troop construction capability in-country was essentially non-existent, and the deployment of engineer troops to RVN would be severely hampered by the decision not to call up reserves.[75]

Although the capability, and sometimes, the necessity to use a construction contractor in a combat environment was demonstrated in RVN, the general preference for the use of troops to the exclusion of the contractor was evident early in the conflict and has persisted to date. The Army's basic position early in the conflict is contained in testimony presented to Congress in January 1966:

---

[74]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 114.

[75]Raymond, "Observations . . .", Op. Cit., p. 25.

> The major advantages (of using engineer units for construction) stems from the control exercised by the commander over his troops. This gives him greater flexibility of movement and employment, and the ability to react quicker to changing conditions caused by hostile enemy action. The ability to provide this security and to continue working under fire gives the commander control that cannot be duplicated with civilian contractor personnel.
>
> . . . The flexibility of employment of the engineer units extends to using them as a reserve of combat forces for use as infantry should the need arise.[76]

In his Observations . . . Brigadier General Raymond confirmed the preference for troops but recognized that there were significant advantages to using a contractor under certain conditions. He concluded:

> Use of construction contractors in an active theater is an acceptable substitute for troop units, provided contractor efforts are confined to heavy construction, in a limited number of reasonably secure locations where the heavy volume of work justifies the cost of mobilization.[77]

General Raymond further commented on the relative desirability of troops as opposed to contractor forces as follows:

> Troop units have a universal capability which is designed to give them considerable flexibility as to where they can go and what they can do. They can move quickly and can go to work with little lost motion. In many respects they are made up on the basis of specific capabilities tailor-made to a given job or jobs within an area. They require extensive base facilities to which they are essentially tied. They require considerable time to mobilize on a job. On the other hand contractor forces, because of their tailored make up, are more efficient than troop units since the latter must adapt a universal capability to specific tasks.[78]

---

[76]U.S., Congress, House of Representatives, Subcommittees of the Committee on Appropriations, Supplemental Defense Appropriations for 1966, Testimony of MG W.R. Shuler, Director of Installations, Deputy Chief of Staff for Logistics, U.S. Army, p. 189.

[77]Raymond, "Observations . . .", Op. Cit., p. 145.

[78]Ibid., p. 31.

In commenting on the subject, an Air Force representative said:

> The relative shortage of in-being troop construction support has reduced the flexibility commanders require under war conditions . . . Basically, SEA is an environment in which troop construction is more feasible than contractor operations. Troop labor should be used to a much greater extent and the contractor reduced to enclave construction where requirements and programs are more stable.[79]

Navy managers also took the position that "construction required in direct support of expeditionary forces and tactical operations should be accomplished by troops to the maximum extent possible", but "that planning for contingencies (should) give consideration to the use of a construction contractor to augment troop construction capability."[80] Also, the Special Military Construction Study Group convened by the JCS concluded that "construction required in contingencies should be accomplished by troop construction units to the maximum extent possible". But, "civilian contractors should be considered for augmentation of troop construction capabilities commensurate with tactical conditions".[81]

In spite of the foregoing however, it is interesting to note that, in a presentation to the JCS in late September 1969 given by the Deputy Director of Construction, MACV, the overall flexibility and adaptability of engineer troops were rated, at that time, inferior

---

[79]U.S., Department of the Air Force, Southeast Asia Construction Management, Deputy Assistant Secretary of the Air Force, Washington, D.C., Memorandum, December 12, 1966.

[80]U.S., Department of the Navy, Analysis of RVN Construction, September 1967, pp. 14, 16.

[81]U.S., Joint Chiefs of Staff, . . . Special . . . Study Group (U), Op. Cit., pp. 42-43.

to that of the contractor. This was thought to be because engineer troops had become closely associated with the units to which they furnished operational support, and the latter resisted efforts to relocate units as dictated by military construction projects.[82]

In summary, the Services' consensus clearly indicated a preference for troops; however, the need for contractor participation was recognized to accomplish the heavier, more sophisticated construction, particularly in relatively secure enclaves.

The pattern of the foregoing philosophy is clearly reflected in the history of mobilization of the troops and contractor and the eventual types and locations of work perferred by each. Figure 3 reflects the buildup of construction forces and trend toward troop dominance. Troop levels increased steadily as units were trained, equipped and made available for construction. The more extreme shifts in the contractor force size was the result of several significant decisions and events. During the summer/autumn of 1966, a series of articles appeared in the New York Times, the Washington Post, the Engineering News Record, and other U.S. publications that were generally critical of the contractor's management and predicted a major shift of construction effort to troops. Considerable Congressional interest was also evident in this shift. Apparent overmobilization of the contractor in relation to program funding, together with these pressures,

---

[82]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 116, and author's personal experience.

led to considerations to reduce significantly the contractor's workforce by January 1967. However, prospects for rapid troop takeover were dim and in February 1967, Mr. McNamara advised the Congress of plans to ". . . begin to phase-down the contractor effort during Calendar Year 1968, and to complete the phase-down during Calendar Year 1969."[83] Subsequent events, particularly the Tet Offensive in early 1968, caused deferment of this plan. As of the end of 1968, the relative size of the troop/contractor forces were as shown in Figure 3. Although the troops outnumbered the contractor forces almost two to one, their capability for placement of programed construction was comparable. This is because about 50 percent of the available effort of engineer combat battalions and 20 percent of the available effort of construction battalions was devoted to combat support and was not available for construction. This also reflects the different types and locations of work assigned.

The types and locations of work performed by the troops and the contractor have been analyzed on the basis of the actual WIP as of the end of January 1969. As the dominent initial force, the contractor, in the spring of 1966, was mobilized in 47 locations throughout Vietnam. At the peak of his mobilization in autumn 1966, the contractor had major projects underway at 31 locations. This dispersion not only violated the concept of contractor employment previously discussed, but made his forces difficult to protect, administer and control. By

---

[83]U.S., Department of the Navy, Supplemental Data for Congressional Hearings, Naval Facilities Engineering Command: Washington, D.C., Memorandum, February 1967.

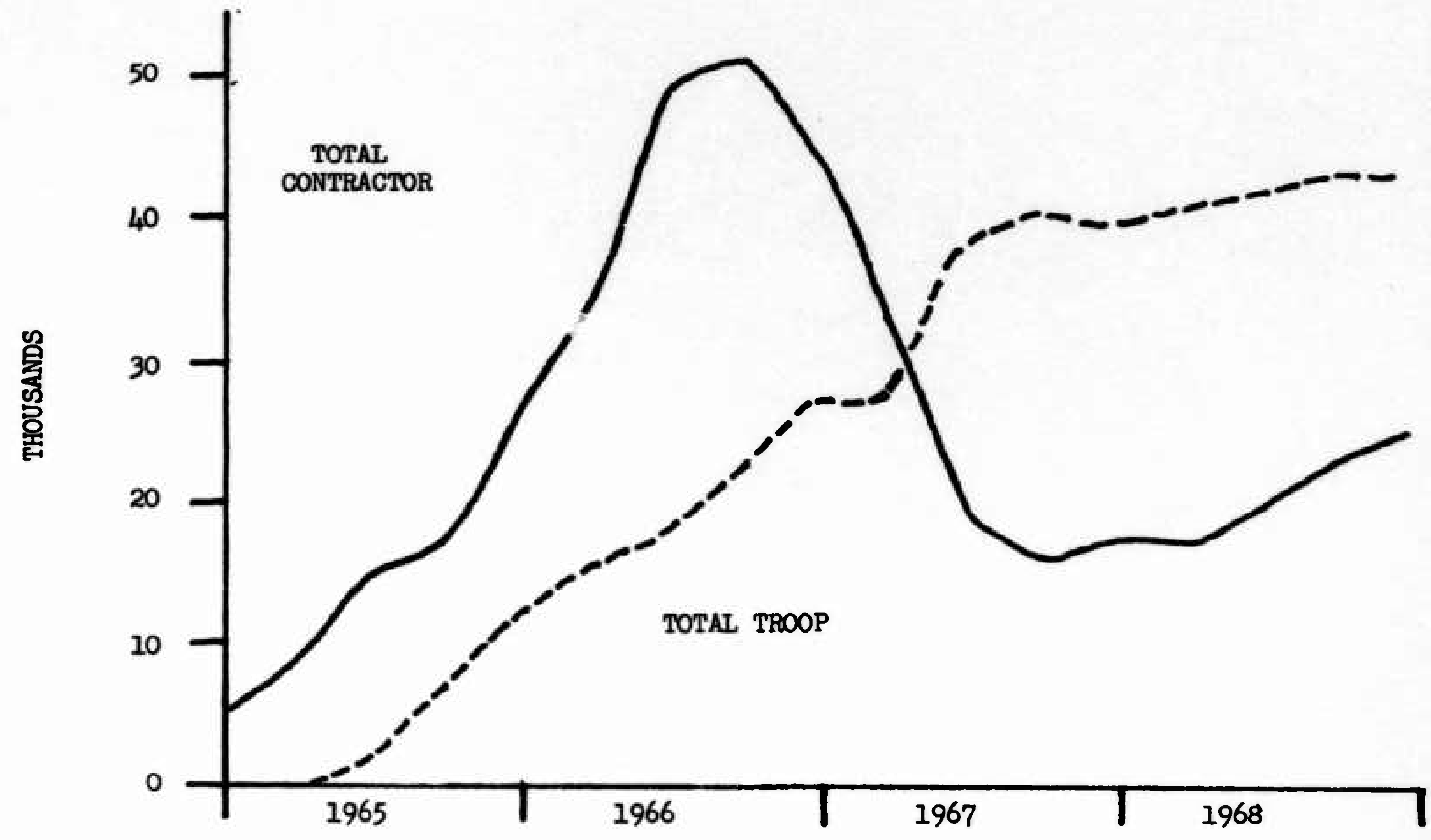


FIGURE 3

CONTRACTOR/TROOP WORK FORCE

Source: Naval Facilities Engineering Command, Vietnam Construction Report, September 1968.

early 1968, major contractor work sites had been reduced to 12 — a more manageable number — located in more secure areas. As the contractor sites were decreased, the troop work sites were correspondingly increased. These 12 contractor sites and representative locations of Service construction units are plotted in Figure 4. This figure shows countrywide construction coverage; the contractor forces in generally more secure areas; and the collocation of troops at almost every contractor site. Collocation was necessary primarily to:

a. handle any portion of the workload beyond the contractor's capabilities

b. accomplish work that could not be assigned to the contractor for security reasons

The shift of the contractor forces to fewer, more secure areas was gradual as the troop-contractor mix changed. A summary of the relative amounts of WIP accomplished through January 1969 at 18 principal locations is shown in Table 5. The dominance of the contractor at such relatively secure locations as Saigon and Tan Son Nhut and dominance of troops at the more remote locations such as Cu Chi and An Khe are readily apparent. Likewise, an analysis of the total WIP as of January 1969 by type of work (Figure 5) shows that the contractor accomplished most of the heavy work, whereas the troops concentrated on the lighter work.[84]

---

[84]U.S., Department of Defense, Military Construction Status Report for South Vietnam, Military Assistance Command, Vietnam: February 28, 1969.

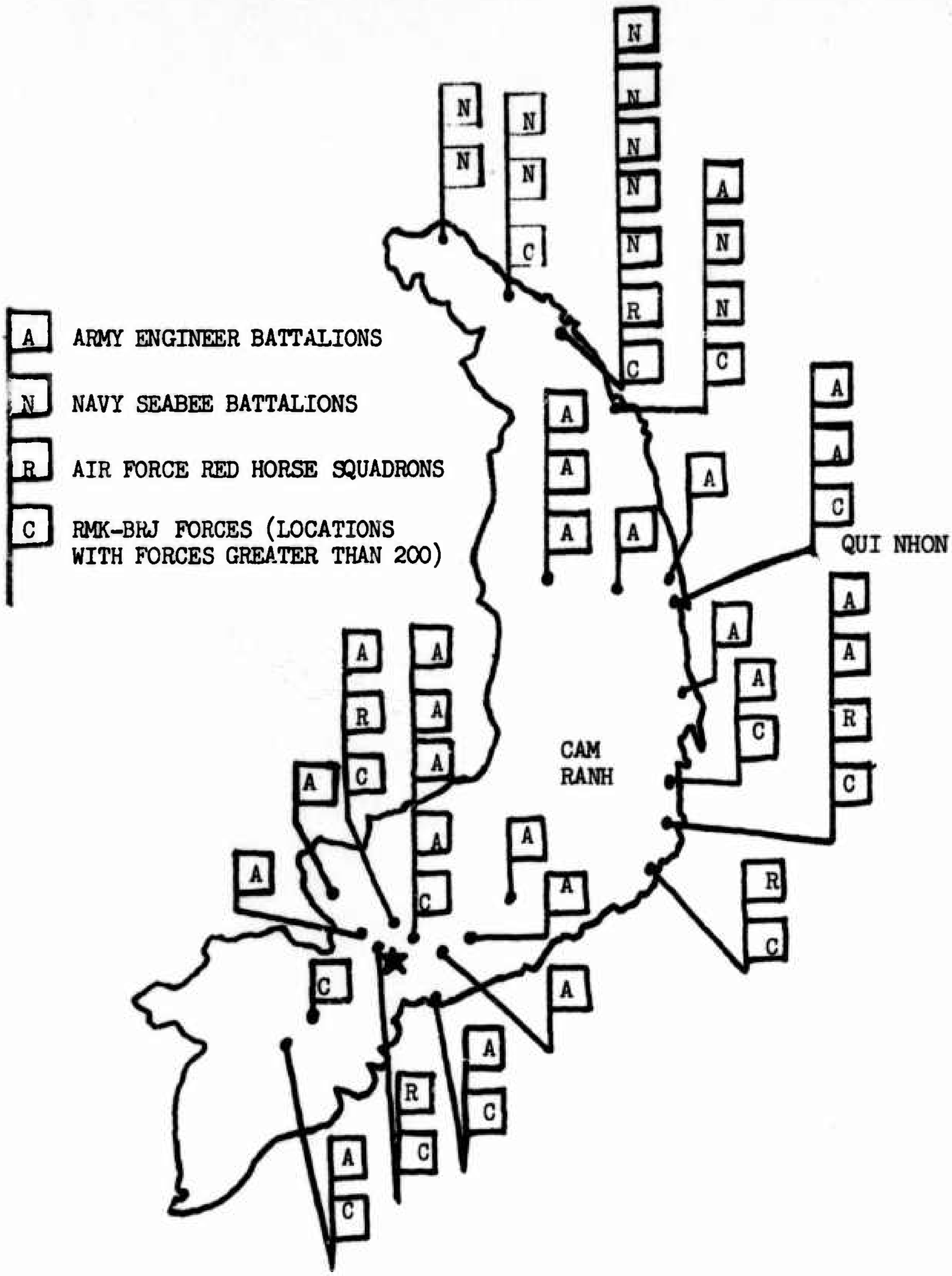


FIGURE 4

REPRESENTATIVE LOCATIONS OF CONSTRUCTION FORCES

Source: Raymond, "Observations . . ."; 1967, G.E. Galloway, Jr. (Maj., U.S.A.), "A Historical Study of United States Army Engineer Operations in the Republic of Vietnam, January 1965-November 1967", Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1968.

TABLE 5

PERCENTAGE OF WORK IN PLACE AT SELECTED LOCATIONS IN VIETNAM

AS OF JANUARY 1969

LOCATION	PERCENT BY TROOPS	PERCENT BY CONTRACTOR
Saigon	2	98
Tan Son Nhut	6	94
Bien Hoa	21	79
Tuy Hoa	22	78
Can Tho	22	78
Cam Ranh Bay	29	71
Phan Rang	33	67
Nha Trang	37	63
Phu Cat	40	60
Vung Tau	46	54
Da Nang	48	52
Chu Lai	57	43
Long Binh	59	41
Qui Nhon	67	33
Pleiku	71	29
Phu Bai	73	27
An Khe	75	25
Cu Chi	92	8
Total	40	60

Source: U.S., Department of Defense, Military Construction Status Report, South Vietnam, Military Assistance Command, Vietnam, 28 February 1969.

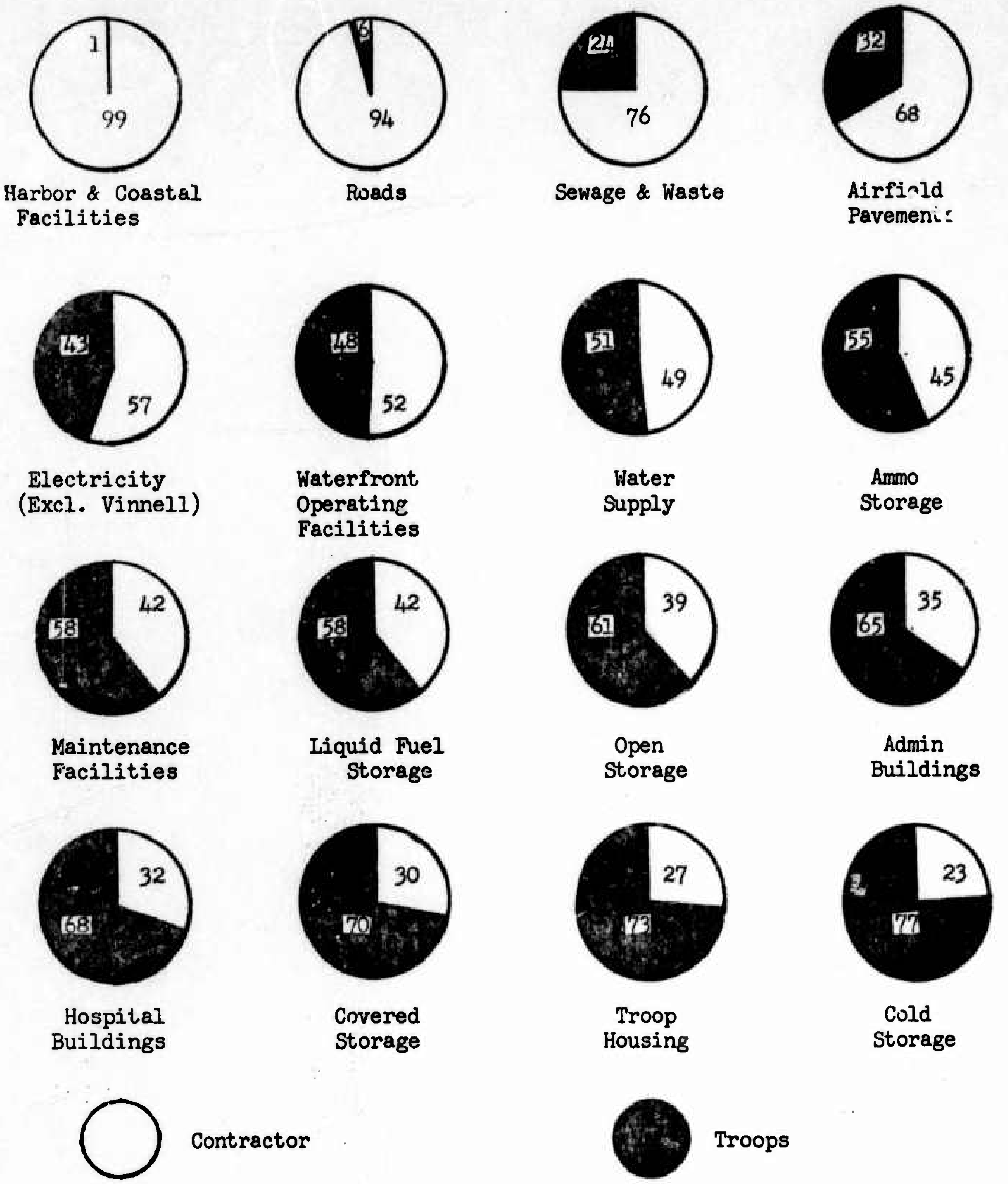


FIGURE 5

MILCON FUNDED WORK IN PLACE - JANUARY 1969

(PERCENT OF WORK, CONTRACTOR AND TROOPS)

Source: U.S., Department of Defense, Construction Status Report, South Vietnam, Military Assistance Command, Vietnam: 28 February 1969.

RESPONSIVENESS

This section examines the responsiveness of the construction effort to meet the needs generated by the military operations in Vietnam. Although the construction program was responsive from an overall viewpoint, there were instances in which operations were impaired by a lack of adequate facilities. Several examples are reviewed briefly. Then, major factors that affected the construction program's responsiveness to war requirements are identified so as to spotlight areas that need improvement.

Responsiveness - Adequate or Inadequate? The degree to which the construction program in RVN satisfied or was responsive to user requirements is very hard to measure. Any analysis of apparent shortcomings must consider the size of the program, the complexities of its management, and the fact that the construction program has been, in the words of Secretary Ignatius, "a fabulous success story".[85] In his Report on the War in Vietnam, General Westmoreland said: "Despite (numerous) obstacles, the construction mission was successfully and efficiently performed and the face of Vietnam was changed".[86] Brigadier General Raymond stated that the basic purpose of the construction program had been achieved and that, among the criticism of the construction program, "conspicuously absent is any criticism that the

---

[85] U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 143.

[86] Westmoreland and Sharp, Report on the War in Vietnam, Op. Cit.

program failed to provide required facilities in a timely manner".[87] A subcommittee of the House Armed Services Committee reported in May 1967: "The subcommittee is satisfied that the program is being effectively managed and that construction is proceeding at a desirable rate. In fact, the accomplishments to date obtained the highest praise from the members."[88]

From an overall viewpoint, therefore, the construction program was never a limiting factor in the prosecution of the war. On the other hand, there were numerous occasions when facilities were not built when they were needed. A former Army Chief of Engineers stated in 1967:

> There has been a tremendous amount of construction accomplished and it is generally of good quality. With few exceptions, the Component Commanders stated that much of the hard core operational requirements except roads have been met. They pointed out, however, that there were many other requirements programmed or not yet programmed which are essential to their effectiveness and efficiency which will not be completed (when required). They further pointed out that new requirements will develop with changes in the tactical situation.[89]

Operational Impact of Construction. Many elements of each of the Services, particularly the combat support and logistic elements,

---

[87] Raymond, "Observations . . .", Op. Cit.

[88] U.S., Congress, House of Representatives, Committee on Armed Services, Report on Special Subcommittee Following Visit to Southeast Asia, May 6, 1967, p. 1881.

[89] W. K. Wilson, Jr. (Lt. Gen., U.S.A. [Ret]), Review of Southeast Asia Construction Program (U), April 17, 1967 (CONFIDENTIAL) as mentioned in Logistics Support in the Vietnam Era . . ., Op. Cit., p. 144.

are largely dependent on the adequacy of the facilities from which they operate to achieve maximum effectiveness and efficiency. In the absence of adequate facilities, these forces accomplished their missions under the most adverse field conditions. Where port facilities were inadequate, supplies were hauled across the beach and moved inland by whatever means could be devised. Convoys often found their way over nearly impassible roads in the face of enemy resistance. In the absence of hardstands and roads, dozers were used to shove heavily loaded ammunition trailers through the mud to improvised storage pads. Those Herculean efforts were truly among the remarkable feats of the conflict. But, in some cases the lack of adequate facilities had a clear impact on operational performance. The following paragraphs discuss examples of these cases. In every case examined, there were reasons why the work was not done when needed; shifting of priorities, shortages of materials and equipment, funding problems, lack of program definition, were but a few of the difficulties faced. Also, circumstances often looked substantially different from the viewpoints of the user and the construction manager. The following examples serve as a basis for the rest of the section, which studies the factors that had the greatest bearing on the responsiveness of the construction program.

a. The Channel at Chu Lai: The problem of getting supplies ashore at Chu Lai, where the Marines were landed on May 7, 1965, was extremely critical. Chu Lai's relative inaccessibility by land placed primary dependence on resupply by sea, mainly from Da Nang. For about

four months, resupply was made across an exposed, soft sand beach; storms often wiped out the causeway used to off-load landing ships, tank (LSTs). Considering the difficulties of resupply of Chu Lai, even during the Summer, it became clear that the situation could be untenable during the monsoon season, expected in October. With approximately 15,000 personnel to be supported at Chu Lai, the Navy designated the port to function as a subdepot of Da Nang, receiving off-shore shipments using over-the-beach techniques, and directed development of an all-weather over-the-beach off-loading capability. Part of the plan called for dredging the shallow bar across the entrance to the port, and erecting navigation aids. Steps to have this accomplished were taken through the OICC, RVN. A small dredge was scheduled for the first week of August 1965, and indications were that a larger one could be obtained if needed. It was not, however, until the monsoon season ended in the spring of 1966, approximately nine months later, that the dredging was actually completed. This was due primarily to the lack of adequate dredging equipment, which was to serve as a limiting factor on construction of essential port facilities throughout RVN during the entire conflict. Inadequacies in port facilities came close to limiting operations in I Corps Tactical Zone (I CTZ) and would have done so had it not been for the ingenuity and extraordinary performance of the individuals concerned. For example, at Chu Lai operational success was largely dependent on the fact that small, lightly loaded LSTs were able to bounce their way over the bar on swells of the sea at high tide.

Otherwise, nothing larger than landing crafts, utility (LCUs) could have delivered cargoes.[90]

b. The Pleiku Supply Complex: In order to support tactical operations in the highlands of IICTZ, the 1st Logistical Command established a supply and maintenance complex at Pleiku. Like many other logistic facilities, it was necessary for this one to go into operation before any appreciable construction could take place. The road net was very limited, and there was little handstand. During the monsoon rains of 1967, the maintenance and supply areas were reduced to a sea of mud. Only by the most extreme measures were operations kept going. In August 1967, the Commanding General, 1st Logistical Command, following a visit to Pleiku, determined that adequate support of the campaigns planned for the highlands could not be provided unless minimum facilities were constructed, with emphasis on roads and hardstands, by the next monsoon season. The USARV Engineers were advised by the Deputy Commander, USARV, to have the Pleiku installation "out of the mud" prior to the next monsoon season. A directive was promptly issued, calling for, in addition to other work, 102,000 square yards of hardstands and roads to be built. Work was to begin in October and be finished by Spring of 1968. Staff visits and other follow-up action during the next few months revealed that little was being accomplished. Although committed to the depot, the horizontal effort of the engineer

---

[90]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., pp. 145-146.

group had been largely diverted to other projects of high-command interest. It was determined that the maximum amount of paving that could be accomplished prior to June, the expected start of the new monsoon season, was only 30,000 of the directed 102,000 square yards. Extra effort by the engineers and the fortuitous delay of the heavy monsoon rains allowed somewhat more than this to be actually completed, but the logistic complex entered its second season of heavy rains with less than half of its essential roads and hardstand.[91]

c. Small Bases: Obtaining construction support at small bases was a particularly difficult problem. Although engaged in important, essential operations, these bases, because of their remoteness and size, were often unable to compete successfully with larger units and installations for the available construction effort. Typical of these small bases were the Navy's MARKET TIME and GAME WARDEN bases in II, III and IV CTZs. Captain H. T. King, a former commander of the Naval Support Activity, Saigon, spotlighted the Navy's construction problem at these bases stating:

> Navy bases were in general far down the priority list among total construction requirements in Vietnam . . . with the exception of one tent compound at Dong Tam, those bases not authorized military construction funds were constructed on a self-help basis . . . other forces were scheduled to handle the construction requirements.[92]

---

[91] Ibid., pp. 147-148.

[92] H. T. King (Capt., U.S.N.), Comments Relating to Logistic Support in Vietnam, Late 1965-Spring 1967, NAV SUPPACT, Saigon, Memorandum for Record, Naval Support Activity: Saigon, Vietnam, n.d.

Obtaining construction for these bases by means of small O&M projects was almost impossible. The Army was responsible for providing facilities maintenance support to the Navy's installations in II, III, and IV CTZs, but, in the Army's allocations, little was available for these small, remote Navy stations. The problem persisted until the Navy mobilized and deployed its own maintenance organization to these bases.[93]

Other small bases that experienced similar problems included many of the MACV advisor sites. Support of all but the largest of these sites was virtually nonexistant. As late as 1968, the advisors were primarily reliant upon the Vietnamese for the adequacy of their facilities.[94]

d. Air Base Construction: Because of its better initial base development planning capability, the Air Force gained about one year on the other Services in planning and executing its program.[95] Also, the Air Force bases were assigned a high priority during the early buildup, and the Air Force had gotten part of its program completed as Military Assistance Program Projects. But, by early 1966 the Air Force became really concerned with the progress of work on its expeditionary airfields, and the prospects for early commencement of work on a badly needed additional airbase at Tuy Hoa were not encouraging. Work was slipping at the important airfields at Cam Ranh Bay and Phan Rang and

---

[93]U.S., Department of the Navy, Command Brief, United States Naval Activity: Saigon, Vietnam, September 24, 1968, p. 21.

[94]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 148.

[95]Raymond, "Observations . . .", Op. Cit., p. 9.

the overall average of construction progress in the funded Air Force program was about nine percent as opposed to the 20 percent that the Air Force felt should have been completed. At about this same time, airfield congestion at the existing in-country airfields began to be a serious problem. Concurrently, construction priorities were shifted from airfields to ports. Continuing Air Force concern with the progress of airbase construction led to the proposal — approved by the Secretary of Defense in May 1966 — for a separate Air Force - managed TURN KEY contract for construction of Tuy Hoa Air Base. Construction of the base was completed in May 1967, 11 months after mobilization of the contractor.[96]

Factors Affecting Responsiveness. A review of the construction program as a whole reveals that there were four major aspects of the program and the organization for its execution that had a significant impact on the degree to which commanders at all echelons regarded it as responsive to their needs. These were: the construction effort available, procedural constraints, construction standards, and organic capability for construction.

a. Construction Effort Available: What ever the size or scope of the construction requirements, there are limits to the funds that are made available, the number of construction troops that can be mobilized and managed, and the materials that can be supplied. These limits

---

[96]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., pp. 148-149.

inevitably result in a back log of construction. Within reasonable limits, a backlog aids coordination of the available work effort and encourages more efficient management of the program. On the other hand, the larger the backlog, the greater will be user dissatisfaction, since it means a longer wait for the average project. It further increases the probability that some projects will never be completed, as small, low priority projects tend to be pushed back as more high-command projects are added. An equitable balance is difficult to obtain and requires considerable managerial judgement. Throughout the Vietnam conflict, the total backlog for both troops and the contractor was 18 to 24 months.

The available output of the construction forces is directly related to the manner in which they are managed. The user not only receives increased support through good management, but he is also likely to be more satisfied with the support he is getting if he has confidence in the managers of the construction forces. A key factor in this evaluation for RVN was the construction reporting system. Unfortunately, the delays inherent in assembling, collecting and publishing the data; the vacillation in priorities; the frequent diversion of construction effort; and the undue concern at higher levels of construction management with fiscal matters made it difficult for the system to provide commanders with such vital information as reliable estimated completion dates. Consequently, it was often difficult for commanders to evaluate the support they were getting without considerable monitoring by their own engineer staffs.[97]

---

[97] *Ibid.*, pp. 149-150.

b. Procedural Constraints: Probably the greatest source of user dissatisfaction with the construction program resulted from the procedure to request construction and to get it approved, funded and built. For the first time in history, peacetime funding procedures were imposed on the management of military construction in the combat zone. From the standpoint of responsiveness, the primary problem was that the procedures were designed to satisfy DOD and not the user. A second problem was that, in the absence of adequate base development planning, the fiscal programing procedures were used as a planning tool. The built-in delays were appreciable for those managing the program. As summarized in a Navy position paper:

> "The stringent funding and management techniques required to maintain the cost control demanded by the system involve a larger number of people in the OICC, MACV, and the contractor, and in addition contribute heavily to the requirement for in-country automated data processing equipment.
>
> But the most severe aspect of the financial control constraint is that, under this system, sponsor's operational requirements must often take a back seat to the cold hard realities of lack of funds. Basic to the funding system is the "fully funded" concept, which requires that the total funds required for the construction of all projects be available and reserved prior to construction start. Since both program definitions and stability of estimated costs of construction by project cannot be realistically achieved in the Vietnam environment, the entire financial control system takes on an unrealistic aura, and continued adherence to it promises to complicate further an already complicated pattern.[98]

---

[98] U.S., Department of the Navy, Construction Constraints, January 20, 1967, Naval Facilities Engineering Command: Washington, D.C., Table II, p. 36.

As onerous as these procedures were at the management level, their effect at the user level was at least as burdensome. A detailed line-item justification was required for every MILCON funded project. The justification had to be submitted on the complex DD 1391, the preparation of which is governed by a rigid set of rules. The problem was complicated by the fact that the fluid situation in RVN made advance base planning very difficult. One commander described the situation at the end of 1965 as follows:

> . . . Very few people realize the great amount of changes that have taken place in troop disposition . . . I would say that for every location that was finally decided upon for a tactical unit that a minimum of ten other locations have been massaged for each one accepted. And this of course takes much staff time, reconnaissance and so forth to accomplish.[99]

As the conflict intensified, the base development picture became more stable, but the chaos was never totally eliminated. At all levels of command, the complex DD forms 1391 had to be made and remade many times before final approval and funding were obtained. Supporting base development plans also required continual detailed updating.[100]

Further complicating the problem for the user was the fact that MILCON-funded construction was only one of the ways in which vitally needed engineer support was obtained. In late 1968, Major R. J. Polo, Directorate of Engineering, Headquarters, 1st Logistical

---

[99]U.S., Department of the Army, Historical Review, Colonel Robert Duke, U.S.A., Commanding Officer, 1st Logistical Command, United States Army, Vietnam, January 3, 1966.

[100]Eifler, (Maj. Gen., U.S.A.), Debriefing Report, August 1967, Also, author's personal experience.

Command, made a study of the various procedures that were required to be followed to obtain engineer support. His findings are shown on Figure 6. A detailed explanation of this maze is beyond the scope of this section, but it is noteworthy that there are seven distinct procedures involving three different forms of documentation. A decision at any level that a different procedural route should be followed normally did not result in a lateral shift to the proper route but in a return to the beginning and a requirement to start again under a new set of rules. This was a particularly acute problem in the Army.

The procedural problems discussed in the preceding paragraphs resulted in a requirement for substantial engineering staffs at all levels to obtain engineering support. The amount of staff work devoted to procedural matters is a matter for speculation. But, in aggregate, it represented a substantial dissipation of engineer talent.[101]

c. Construction Standards: The need to establish construction standards was discussed in some detail earlier. As regards user satisfaction, the establishment of standards influences the user insofar as the standards meet the user's own concept of his requirements or are at least as good as the standards afforded to other users. In his Observations . . ., Brigadier General Raymond noted a wide difference in Service standards early in the buildup.

---

[101]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., pp. 150-151.

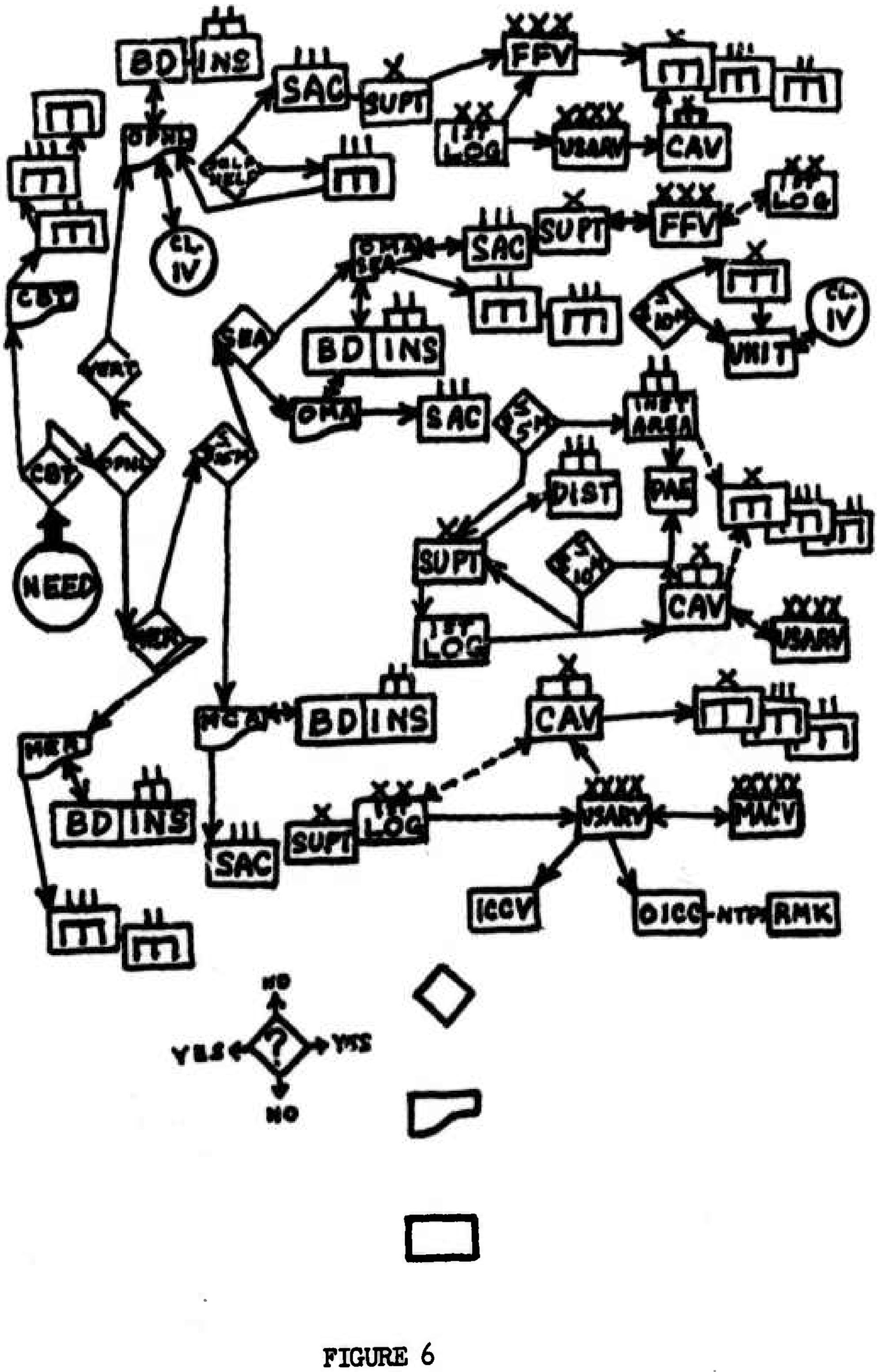


FIGURE 6

ENGINEER SUPPORT FLOW

Source: U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., 1970.

FIGURE 6 (Continued)

Legend

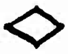
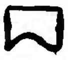
	Question/Decision
	Request
	Organization
CBT	Combat Support
OPNL	Operational Support
MER	Minimum Essential Requirements
BD	Installation Review Board
INS	Installation
MCA	Military Construction, Army (Funded)
OMA	Operations and Maintenance, Army (Funded)
SEA	Southeast Asia Huts
SAC	Sub-Area Command
SUPCOM	Support Command
FFV	Field Force, Vietnam
1st LOG	Hq, 1st Logistical Command
CAV	U.S. Army Construction Agency, Vietnam (USAECAV)
DIST	USAECAV Engineer District
AREA	USAECAV Area Engineer
VERT	Vertical Construction
PAE	Pacific Architects and Engineers — The Army's Facilities Maintenance Contractor
OICC	Officer in Charge of Construction (Naval Facilities Engineering Command)

FIGURE 6 (Continued)

Legend

RMK	Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones — The Navy's Construction Contractor
NTP	Notice-to-Proceed
Cl IV	Class IV (Construction) Materials Yard

> . . . Wide variations became apparent; and considerable dissatisfaction arose, particularly where units were collocated. Initial attempts at reconciliation of standards within RVN sought to establish a common denominator which would have had the effect of lowering standards of the Air Force and Navy and raising those of the Army and Marine Corps.[102]

The disparity of standards at installations, such as Cam Ranh Bay, became a matter of Congressional interest, and a subcommittee of the House Armed Services Committee touring RVN in early 1967 reported " . . . That cantonment construction in the Army program had not progressed at the same rate as some of the other facilities, and were at a considerably lower standard than the cantonments of other services . . . The subcommittee believes that, especially when cantonments are in close proximity, the greatest care should be exercised to maintain a common standard . . .[103]

d. Organic Capability for Construction: The extent to which a commander considers the overall construction program to be responsive may depend to a large degree upon his ability to satisfy some of his requirements, particularly the smaller, more urgent projects, with his own resources. Most units in Vietnam had some organic capability. The combat divisions had engineer battalions as part of the basic organization. In I CTZ, the Fleet Marine Force engineer battalions and the SeaBee construction battalions provided additional support to meet operational commitments, and in II, III and IV CTZs, USARV's 18th and 20th Engineer Brigades provided backup support. The Air Force had its RED HORSE battalions.

---

[102]Raymond, "Observations . . .", Op. Cit., p. 13.

[103]U.S., Congress, House of Representatives, Op. Cit., p. 1880.

Not all units at all echelons had organic engineer capabilities, however, the following examples are given to illustrate problems encountered in the absence of such a capability.

The Air Force, at the outset of the Vietnam conflict, had only its existing base civil engineering forces in-country. Although they were augmented with temporary duty personnel and local nationals, they were inadequate to meet Air Force needs for an organic minor construction capability. The initial solution was to use PRIME BEEF teams, which were small task forces made up from base maintenance units in the Continental United States (CONUS) that were sent to RVN for periods of 120 days to accomplish specific projects. The Army was responsible to "provide the number of troop units, by type, in the Active Army, and Reserve components of the Army . . . to satisfy mutually agreed upon (Air Force) requirements".[104] On this basis, the Air Force, looking for a more permanent solution, asked for assignment of specific Army engineer units to the Air Force. This request was not honored on the grounds that Army engineers were joint assets and MACV would meet Air Force needs from the overall in-country engineer resources. This did not satisfy the Air Force. The Air Force was responsible for maintaining "a capability for the emergency repair of bomb damaged air bases within the organic capability of air installation resources".[105] Because it

---

[104]U.S., Department of the Army, Troop Construction for the Air Force, Army Regulation 415-30/Air Force Regulation 88-12, July 26, 1965, paragraph 3.d.

[105]U.S., Department of Defense, Responsibilities for Military Troop Construction Support of the Department of the Air Force Overseas, Directive 1315.6, paragraph IIIb, February 5, 1967.

did not consider its engineer support adequate, the Air Force requested and was given authority in late 1965 to organize six Heavy Repair Civil Engineering (RED HORSE) squadrons for use in Vietnam and Thailand. These squadrons were to alledgedly "repair airfield damage caused by enemy action or natural disasters". Actually, they provided the Air Force with an organic construction capability, and augmented MACV resources available to accomplish MILCON work.

The Army's 1st Logistical Command (1st Log Comd) was, until July 1, 1968, responsible for the Army's facilities maintenance program. Its principal resources were the PA&E contract force, and several small engineer troop detachments. Through the use of its $25,000 O&M minor new construction approval authority, the command had a ready resource to meet many of its urgent construction needs. But, on July 1, 1968, the maintenance mission and resources were transferred to the newly born United States Army Engineer Construction Agency, Vietnam (USAECAV). Following this 1st Logistical Command became one of the few major USARV commands without any organic engineer capability. The CG, 1st Log Comd retained project approval authority for his essential jobs, but had to rely on USAECAV units to perform the work. Although USAECAV's support to 1st Log Comd was as good as that furnished any other organization, the absence of organic forces was felt almost immediately.[106]

The Army's facilities maintenance contractor, PA&E, had an organic resource that could not be used effectively to construct vitally

---

[106]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 155.

needed facilities. The contracts negotiated with PA&E specified that the contractor's forces could be used only in O&M funded work. The use of these forces on MILCON jobs was expressly prohibited. This was done primarily to keep PA&E from competing with RMK-BRJ. However, in order to function at optimum effectiveness, PA&E needed adequate facilities, including shops, warehouses, offices, and billets to support its mission. These were duly requested, but due to the relatively low priority of PA&E facilities in the overall country construction situation, PA&E was plagued throughout the conflict with inadequate facilities. As has been previously noted, until well into FY 68, PA&E forces were used essentially for O&M minor new construction work, not for maintenance and repair as such. Some of the contractor's own facilities were, in fact, constructed by this means, but the $25,000 limitation was too restrictive for the contractor to really satisfy many of his own needs. A better course of action would have been to provide for construction of the contractor's facilities using his forces and MILCON funds. Accordingly, the contract for FY 70 was changed to allow this. By that time though, little could be done. Had this action been taken earlier, it might have substantially improved the contractor's ability to perform his maintenance mission. This case highlights a corollary to the adequacy of organic resources, namely the authority to use those resources. In the absence of such authority, construction assets may be under utilized or unauthorized construction may become widespread.

THE KINGDOM OF THAILAND (1966-1969)

The construction management situation in Thailand varied somewhat from the Republic of Vietnam. The major facilities needed were primarily to support the Air Force in its combat role with secondary requirements to provide logistic and Military Assistance Program (MAP) facilities for all the Services. The Commander, United States Military Assistance Command, Thailand, exercised coordinating authority over the construction program other than MAP, over which he had complete authority. The components had normal cognizance over the projects needed to support Vietnam operations. The Navy Facilities Engineering Command's Officer in Charge of Construction, located in Bangkok, managed the contract construction execution, coordinating with the Air Force Regional Liaison Office, Bangkok. At various times, engineer troops of all the Services performed construction in addition to that done by the contractors. In general, the complexity and scope of the program did not justify the extraordinary management procedures established in Vietnam. The expansion of the airfield facilities at Ubon, Takhli, Udorn, Nakhon Phanom and Korat; the construction of the Utapao Royal Thai Air Force Base; the extension and improvement of the land lines of communication by Army engineers; and the development of the Sattahip port complex are examples of some of the important construction works completed during and subsequent to the buildup.[107]

---

[107]U.S., Department of Defense, Logistics Support in the Vietnam Era . . ., Op. Cit., p. 18.

BACKGROUND

Military construction activities in Thailand were started in 1956. Initial dollar input was negligible. However, in 1966, the size of the program increased dramatically. In anticipation of large increases in construction work, the Department of Defense (DOD) mobilized two cost reimbursable contractors from the United States. By June 30, 1967, an estimated $165 million worth of construction had been assigned to these contractors, and over all U.S. construction costs in Thailand — expended or committed — had increased to $337 million.[108] In all, appropriations for military construction in Thailand for fiscal years 1965 through 1969 amounted to about $395 million.[109]

EXECUTION

As in other areas, the Thailand construction program produced numerous examples of tremendous effort, efficiency and cooperation to get a job done on time. A case in point is the Kanchanaburi project, in which a training base for the Thai division being sent to Vietnam was built in late 1967 and early 1968 and proceeded from design to completion in four months. The project involved Navy administration, a civilian architect-engineer firm, Army construction troops and over

---

[108] Comptroller General of the United States, Report to Congress, "U.S. Construction Activities in Thailand, 1966 and 1967", General Accounting Office: Washington, D.C., November 13, 1968, p. 1.

[109] Comptroller General of the United States, Report to Congress, "Problems in the Administration of the Military Building Program in Thailand", General Accounting Office: Washington, D.C., June 12, 1969, p. 1.

1,000 indigenous laborers. Sine qua non for its success was the "Who-Cares-What-Color-Uniform-You-Wear" cooperation of these diverse groups. The total scope of the project comprised over $3.5 million of work - 750 buildings containing approximately 700,000 square feet of floor space, 20 kilometers of base roads, five kilometers of electrical distribution system, over 50 ranges, a sewage collection and disposal system, and a 3,200 foot long airfield built by Army engineers in 17 days using M8A1 matting. Many efficiencies and economies were incorporated into this project. Making maximum use of on-shelf plans and emphasizing use of pre-fabricated structures to the utmost, the Architect-Engineer finished the designs in only three weeks. Repetitive construction techniques were maximized; 642 of the buildings were pre-fabricated, of which 420 were identical except for length. Locally available materials were used wherever possible. Practices such as these allowed the project to be completed on schedule despite the fact that temperatures often hovered at 120 degrees in the shade.[110]

PROBLEMS

However, as anywhere else, the Thailand Construction program had its difficulties. It was beset by constant changes in the scope of work. The General Accounting Office (GAO) believes that the following matters might not have arisen had there been better management of the program.

---

[110] Bruce H. Edelson (Lt. Col., U.S.N.), "Navy OICC Thailand Administers Kanchanaburi Project", The Navy Civil Engineer Magazine, 10, No. 2, February 1968, pp. 10-14.

> . . . After programming \$19.8 million in January 1966 for the construction of a complete tactical airbase to be operational by January 1967, DOD reevaluated the need for the project . . . the same month that the cost reimbursable contractor began mobilizing from the United States to build a complete base, the aircraft deployments intended for this location were deferred and funding was curtailed to the extent that most of the facilities necessary . . . could not be built. As a result of numerous changes in construction plans, a \$15.2 million "bare base", consisting essentially of an unlighted runway and related airfield pavements, was built.[111]

To use the base for one limited training exercise, its main use since completion, the Air Force had to bring in ground personnel, communications equipment, fuel, fire protection equipment, and maintenance facilities.

Also, because of changes or deletions to other projects programmed for construction, costs of approximately \$1.3 million had been incurred, as of November 30, 1966, for various architectural and engineering services which were of little or no value.

Several relatively minor problems revolved around the contractors purchasing some items locally that were available at significantly lower prices from U.S. sources, often when there was apparently no urgent need or with no decrease in delivery times. Another minor problem concerned Air Force use of contract architect-engineers at a cost of \$1.2 million when civil service employees could have been used at less cost.[112]

---

[111] Report to Congress, November 13, 1968, Op. Cit., p. 1.

[112] Ibid., p. 2.

There were more pressing problems, however, which had more wide ranging consequences. GAO found that . . ." the organizational structure established to administer the military construction program in Thailand was not adequate to enforce Department of Defense (DOD) policies regarding austere construction and to coordinate the siting of proposed construction projects". As a result: "the types and costs of personnel housing constructed in Thailand differed substantially from DOD-prescribed austerity standards. For example, several housing projects cost an estimated $3.3 million more than they would have had DOD standards been adhered to".[113] In many cases, there had been delays in specifying the types of construction considered to meet in-country austerity standards. Also, DOD-established cost and square-foot limitations for the types of housing constructed had often been exceeded.

In early 1965, the Deputy Assistant Secretary of Defense (Properties and Installations) gave the Department of the Navy the responsibility for design and construction standardization in Southeast Asia and stressed that construction should be held to the minimum essentials consistent with functional needs and limited tenure. In April 1965 the Commander-in-Chief, Pacific (CINCPAC) gave the Commander, Military Assistance Command, Thailand (COMUSMACTHAI)authority for final approval of standards for Thailand as developed by the OICC and authority for allowing deviations on a case-by-case basis.[114]

---

[113] Report to Congress, June 12, 1969, Op. Cit., p. 1.

[114] Ibid.

In April 1965 the OICC, Southeast Asia, contracted with an architectural-engineering firm to develop a two part volume containing detailed drawings of standardized buildings for reference by various agencies in planning, programing and budgeting future construction for the Republic of Vietnam and the Kingdom of Thailand. The definitive drawings pertaining to Thailand were approved by COMUSMACTHAIand issued in May 1966 as a book of "Standard Definitive Designs for Military Buildings and Structures, Thailand". OICC, Thailand forwarded this document to the Services and informed them that it was a catalogue of facilities drawings for which final plans and specifications were available. Also, OICC requested that the Services use these drawings whenever possible.[115]

In spite of this, there was a tendency on the part of the Services to issue to OICC, Thailand design instructions based on guidance developed by the individual Service, and in some cases, manuals for permanent construction were specified as guiding criteria. Although it appeared to be OICC's policy to strive for the lowest cost construction, when the Services insisted on the use of their criteria, this was allowed if reasonable and sound from an engineering standpoint.[116]

In July 1966, DOD representatives visited Thailand and expressed concern that construction was not as austere as was intended. The point was emphasized to the Services that design was to be for temporary occupancy. As a result of this re-emphasis, COMUSMACTHAI,with the cooperation of all concerned agencies, published U.S. Military Assistance

[115]<u>Ibid</u>., p. 6.

[116]<u>Ibid</u>., p. 7.

Command, Thailand (USMACTHAI)Regulation 415-2, entitled "Construction Standards for U.S. Forces in Thailand", which was issued on November 29, 1966, about 21 months after the Deputy Assistant Secretary of Defense had requested the development of in-country standards of construction.[117]

This regulation established the specific responsibilities and the maximum standards related to construction for U.S. Forces in Thailand. It stated that COMUSMACTHAI would establish the necessary construction standards and criteria and rule upon all requests for waivers.

Regulation 415-2 prescribed, as maximum in-country standards, the following types of housing: (1) tents on wooden frames, with wood or concrete floors, (2) tropicalized wood-frame structures, or (3) pre-engineered (prefab) metal or wood structures. Further, it reiterated DOD-established space and cost limitations for the construction of housing, which had been in effect in Thailand for over a year. The space limitations were 70 square feet per man for enlisted men and 110 square feet per man for officers. In addition, a cost limitation of $500 per man was placed on enlisted men's housing. All limitations were exclusive of latrines and bath facilities.[118]

In GAO's tests of 15 housing projects constructed subsequent to DOD's establishment of the above space/cost limitations, GAO investigation found that space limitations had been exceeded in 12 projects, six of which had been designed after issuance of USMACTHAI Regulation

---

[117] Ibid.

[118] Ibid., p. 8.

415-2, and that eight enlisted men's housing projects had cost approximately $3.3 million more than they would have had the $500 per man limitation been enforced. The investigators also found that housing designed subsequent to issuance of Regulation 415-2 was for a more permanent type construction, such as concrete, concrete block, or masonry walls; concrete floors; and cement or concrete roofs.[119]

Despite the above violations, only one documented request for deviation from standards was submitted to COMUSMACTHAI, and that came from OICC, Thailand, not from the Services. Based on the substantial deviation and the failure to coordinate with COMUSMACTHAI, the GAO investigation concluded that the military Services did not fully accept USMACTHAI as the organization for coordinating construction in Thailand.[120]

COMUSMACTHAI had, as early as 1966, requested additional personnel to allow him to execute his assigned tasks. That these were not forth coming was blamed for the fact that there had not been complete coverage of assigned construction management responsibilities, including the policing of construction standards. Finally, in 1968 the engineering staff of USMACTHAI was authorized two additional officer spaces and COMUSMACTHAI authorized a six-month architectural and engineering service contract to study the military construction standards for the purpose of proposing additional in-country standards and developing procedures for enforcement with a limited staff.[121]

---

[119] _Ibid._, pp. 8-9.

[120] _Ibid._, p. 9.

[121] _Ibid._

These actions were commendable, but appear to have been too late in the program to have been of much assistance. The construction appropriations for Thailand decreased from a peak of $193 million in fiscal year 1966 to only $12 million in fiscal year 1969.

Another significant problem concerned siting of facilities. As of November 1967 about $230,000 of lost design costs, involving 49 projects at six Air Force installations, had been incurred because of siting problems. These problems fell into two general categories; site layout problems associated with inadequate coordination between base commands and the responsible design offices, and failure to obtain timely Royal Thai Government siting approval.

Generally, installation facilities were designed by an architect-engineer firm in accordance with the siting on the base master plan. However, in some cases subsequent on site inspection showed that conflicts in siting existed. This happened in many instances because base commanders had built facilities or revised existing facilities without informing the responsible design officials. Consequently, when the conflict became apparent the design had to be revised to conform with the actual site layout. In addition, lost design costs were incurred because preliminary plans approved by the Royal Thai Government were subsequently disapproved due to various changes made to the preliminary plans without Thai government personnel being consulted.[122]

As an example, at Ubon design losses of almost $87,000 were incurred due to resiting. Most of these costs resulted from failure to

---

[122] Ibid., p. 11.

obtain Royal Thai Government approval for the proposed sites. However, in some cases OICC, Thailand had not been notified that buildings were already located on sites proposed for other buildings. In one case the design of an electric primary power generator plant had nearly been finished when OICC learned that the fuel tanks conflicted with existing buildings. In another case an aircraft maintenance complex had to be moved because buildings already existed on the proposed site.[123]

BENEFITS

Although many of the inefficiencies noted could and should have been avoided, on balance the construction program in Thailand appears to have produced tremendous benefits in addition to merely providing facilities for U.S. and Thai armed forces. The projects improved both the military and economic infrastructures. Fortunately, the benefits were most dramatic on the local economy. Wages increased ten-to fifteen-fold in those communities in the vicinity of the projects, and training programs associated with the construction programs immensely improved Thai human resources. During the construction period there was a secondary imput of at least $200 million dollars into the Thai economy by construction personnel.[124]

One author indicates that the sharp increase in U.S. military construction in late 1965 and 1966 was the strongest external factor

---

[123]Ibid, p. 12.

[124]Donovan B. Quigley (Comdr., U.S.N.), "The Impact of Construction Sponsored by the United States on the Economy of Thailand", Thesis, Industrial College of the Armed Forces: Washington, D.C., March 1969, pp. 123-130.

propelling the Thai economy in 1966. Approximately 35,000 Thais were employed on projects by the end of 1966; incomes for farmers in the depressed Northeastern area of the country had increased six times.[125] Road construction, such as that performed by the U.S. Army's 44th Engineer Group in building the Bangkok By-Pass[126] and the Northeast lines-of-communications,[127] tremendously improved the transportation network and opened considerable stretches of new land. Construction of the Sattahip Port and the Inland Road eliminated the perplexing shipping congestion problem at Bangkok Port in only four months.[128]

The construction program is in consonance with the overall aims of the Thai Second Plan for Economic and Social Development (1967-1971), which is striving to eliminate inequities in the Northeast and improve the overall economic base, and should assist in faster economic development and a more even distribution of the benefits of economic growth throughout the country.

---

[125] Allen M. Goodson (Lt. Col., U.S.A.), The Impact of the U.S. Military Construction Program on the Thai Economy , Thesis, Industrial College of the Armed Forces: Washington, D.C., April 1, 1968, pp. 92-95.

[126] U.S., Department of the Army, Operational Report of the 44th Engineer Group (Construction) for the Period Ending 31 October 1968, RCS-CSFOR-65(R1)WA93AA, November 15, 1968, pp. 1-3.

[127] Goodson, Op. Cit., pp. 94-95.

[128] Ibid., p. 95.

THE REPUBLIC OF KOREA (1968)

In early 1968, shortly after the loss of the U.S.S. PUEBLO and the attempted assassination of Korea's President Park, a team of engineer officers was sent on temporary duty by the Department of the Army, at the request of the Commander, U.S. Forces, Korea (COMUSFK), to expand and develop base development plans to support recently revised operational and logistic plans. The five officers selected all had broad engineering experience, including engineer management at U.S. Army, Vietnam (USARV) and Military Assistance Command, Vietnam (MACV) levels.[129]

By this time, as a result of the experiences in Thailand and Vietnam, DOD had decided to provide the COMUSFK with authority to exercise strong, centralized management and direction for the anticipated vastly expanded construction program in Korea. This direction was to be exercised through a Director of Construction, who eventually arrived in June, 1968.[130]

THE METHOD

The first step taken by the planning team was to review existing operational plans, regulations, logistical plans and policies, air/ground lines-of-communication plans and base development plans.

---

[129] James E. Lynch (Lt. Col., U.S.A.), Base Development Planning, Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, December 2, 1968, p. 8. Also, author's personal experience.

[130] Report to Congress, June 12, 1969, Op. Cit., p. 13. Also, author's personal experience.

As a result of this review, the most immediate problem was determined to be a lack of any published guidance on base development. Guidance was quickly prepared, staffed and published as Eighth U.S. Army Regulation 405-2, "Base Development", on April 24, 1968. This document was unusual in that, although the basic text was only six pages, it contained 13 annexes which enumerated in great detail the specific responsibilities of each major subordinate commander (troop units and geographical areas) and provided detailed guidance on plan format, codes and abbreviations used, construction standards, construction planning factors and criteria, and priorities. It assigned major subordinate commanders responsibilities for: (1) preparing a base development plan for all units within their geographical area of responsibility, (2) coordinating real estate and common use facilities for all units in their area, (3) developing joint or combined plans for those joint/combined tenant facilities in which they had primary interest, and (4) submitting appropriate plans and reports on a regular schedule to Eighth Army Headquarters.

Specific guidance required establishment of base development planning boards, assigned programing responsibility for construction, and listed essential planning considerations to be used by commanders.[131]

To give the new planning regulation proper emphasis and insure that high level interest was generated immediately within the subordinate commands, a command letter was issued to all the subordinate unit commanders, which said in part:

---

[131] U.S., Department of the Army, Base Development, Eighth Army Regulation 405-2, A.P.O. San Francisco 96301, April 24, 1968.

> . . . give this project your personal attention to insure the resulting base development plan will be an accurate and comprehensive planning document which will provide the information necessary for decisions of Eighth Army and higher headquarters.[132]

Since this was the first major base development planning project experienced in Korea since cessation of the Conflict, distribution of the base development regulation and the command letter to the field was rapidly followed up by the planning team. Visits and briefings were scheduled with all the major commands and the three general support groups to explain the project, discuss potential problems, answer questions, and establish points of contact.

Based on the above coordination, the major commands began their planning and developed programs to comply with the Eighth Army deadlines. The planning team members regularly checked on progress of the subordinate commands, assisted in coordination between commands, and were continually called upon to assist with solving problems and answering questions concerning the base development planning process, including providing vast amounts of detailed operational planning information not previously available to the subordinate commanders.[133]

In order to further assist the major subordinate commanders, typical planning factors, a sample base development narrative, and a flow process diagram were developed by the planning team. Also, a flow diagram and progress chart were used by the teams to aid in following a tight schedule and achieving various deadlines throughout the planning process.

---

[132] U.S., Department of the Army, Base Development Planning, Eighth Army Letter, A.P.O. San Francisco 96301, April 20, 1968.

[133] Lynch, Op. Cit., pp. 10-11.

As each major subordinate command completed and compiled its base development plan, it was sent to Eighth Army headquarters, and the most difficult part of the planning job began for the team. Each plan was reviewed in detail for accuracy and conformance with the published guidance. Changes needed were then coordinated with the appropriate command. Next information was extracted from each plan to determine the time phasing of construction and construction forces. Based on the anticipated engineer troop availability as specified in the operational plans, the contractor/troop mix needed to get the work done as close to the "as required" times as possible was evolved. After this, the construction costs for various increments were calculated and compiled into an overall base development cost. Overall bills of materials and gross tonnage and cubage requirements were also produced so that construction materials storage and shipping needs could be developed. The total and incremental real estate requirements by major area were also identified. In addition, a special effort was made to identify long lead time hardware requiring special logistical attention and early requisitioning.

Finally, in coordination with the Eighth Army staff, requirements for major functional items, which were independent of the area oriented subordinate plans, were incorporated into the Korea plan by the team. These facilities included inter-theater airfields, POL facilities and pipelines, roads, major medical facilities, and major communications facilities. Certain operational needs and special contingency requirements were also added as appropriate.

The final plan, consisting of five geographical area plans and an all-Korea summary in base narrative format, a compilation of total

facility requirements, costs, troop/contractor mix and phasing, and general recommendations for improving the infrastructure and force readiness, was presented to the Eighth Army Staff in a formal briefing on July 12, 1968, and quickly concurred in. Shortly thereafter, COMUSFK was briefed on the plan and approved it. The 5,000 page document was then reproduced and distributed to all agencies concerned, approximately four months after planning was first initiated.[134]

PLANNING TO REALITY

Another incident in connection with the 1968 Korean scare is worth mentioning, since it is an example, though a relatively minor one, of how use was made of pre-engineered structures to allow COMUSFK to respond in a timely and expeditious manner to increased facilities requirements.

As a result of the "PUEBLO" and "BLUE HOUSE" incidents, the force structure in Korea was considerably expanded, and troops were temporarily redeployed to establish a better military posture for countering potential North Korean threats. By June, 1968, these redeployments became permanent, and the decision was made to upgrade the temporary cantonments; this had to be done before the onset of the harsh Korean winter (desired completion date: November 1, 1968).

At about this time, a new engineer, who was soon to be elevated to the status of Director of Construction, arrived to head the USFK

---

[134] Ibid., pp. 12-14.

Engineer Staff. He had just finished commanding an Engineer division in the continental United States, and had considerable personal experience in utilization of prefabricated structures. As a result, he was able to convince the COMUSFK to provide austere, one-story, relocatable structures, to be erected by unskilled troops who would eventually occupy the buildings.

The Chief of the base development planning team was immediately dispatched to California to expedite the purchase and shipment of the required buildings. Invitations were extended to major building manufacturers on June 25th, and all bids were received by June 28th. On June 29th, the award was made to the low bidder, CUSTOMHOUSE BUILDINGS, DOWNEY, CALIFORNIA. The contract called for 90-one story, 37-man dormatories. Each building was 24-feet by 110-feet; the basic module being 10-feet by 24-feet with a one-foot roof overhang. The frame consisted of steel columns and roof trusses. The roof and wall panels were fiberglass encased. The floor consisted of either a concrete slab or prefabricated steel floor skids over a concrete strip foundation.

Each building was shipped in four packages: (1) Roof Panels, (2) Side Wall Panels and Electrical Fixtures, (3) Steel Trusses, and (4) End Wall Panels; Vestibules and Miscellaneous. Any combination of boxes numbered (1) through (4) made a building. The buildings were well insulated and came equipped with a package air heater augmented with standard army stoves. The dormatories were augmented with latrines and showers at centralized locations.

The buildings arrived in Korea in September of 1968, and as anticipated, proved to be easily erectable by unskilled troops. Each

building had a minimum of fittings, and interchangeable wall and roof panels greatly simplified matters. All buildings were operational well before the onset of winter.[135]

---

[135]James E. Lynch (Lt. Col., U.S.A.), Buildings in Boxes, Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, March 3, 1969, pp. 11-15.

Chapter III

WHERE ARE WE?

This chapter describes and details the most cogent lessons learned concerning base development planning and execution during the more recent phases of the Nation's history. Current and officially proposed base development doctrine, philosophy and techniques are scrutinized to determine the "state of the art". As a result of this examination, a determination of the most significant areas for further improvement and implementation will be made. Emphasis will be placed on those lessons learned and those actions taken as a result of our recent Asian experiences.

LESSONS LEARNED

One of the most important lessons emphasized in Chapters I and II is the importance of timeliness and rapid response in accomplishing the construction program, and subsequently bringing the conflict to a rapid termination. The rapidity with which this can be done is largely a function of the logistics system, but in the base development area, is primarily dependent on the adequacy and sufficiency of the planning effort.

In analyzing the areas of planning and readiness as applicable to RVN, indications are that detailed construction planning had been

done that was in many respects suitable for the specific plan, but was of very little value as the situation actually developed. Thus the Vietnam experience highlighted the importance of construction planning that will minimize time and effort in adjusting to the changes in requirements which are inevitable in war. Included in this was the continuing need for better engineer intelligence prior to initiation of hostilities in the potential theater of operations. The need was demonstrated for a more flexible base development planning system based on gross requirements. Such a system requires adequate engineer staffs, especially during the early stage of the buildup, to adapt these gross requirements to actual field conditions. It also became evident that good planning was not enough; certain aspects of the plans, such as requirements for long lead time items, had to be acted upon early enough to insure a smooth and orderly progression of work once the entire contingency plan was implemented.

Experience in Vietnam also stressed the importance of the interrelated subjects of functional components, preengineered structures, planning factors, and construction standards to both base development planning and the execution of the construction program. It appears essential that there be a full interchange of information in these areas among the Services, the Joint Chiefs of Staff, and the Office of the Secretary of Defense. Also stressed was the need to prefund, prestock and preposition critical long lead equipment and up-to-date, preengineered, relocatable structures.

The RVN experience indicated that it would be appropriate to expand the activities and tenure of the recently established Joint Staff/Services Construction Board for Contingency Operations. This Board is now charged to exchange information concerning results of Service functional component and retrievable concept research and development programs and to develop construction standards and planning factors for adaption to various contingency operations. The functions and activities of this Board will be discussed in greater detail later in the Chapter.

Lessons learned in the general area of execution and implementation from the Vietnam conflict are that, since the consensus of the Services was that troop construction units were preferred as the primary construction resource in the combat zone, planning for future contingencies should be based on the use of engineer troops as the hard core of the construction forces. However, the RVN experience clearly demonstrated the feasibility and, under comparable conditions, the desirability of employing a civilian contractor in a combat zone for major projects in relatively secure areas. This points up the requirement to consider contractor employment during planning for contingency construction and the extent to which the contractor will be dependent on the Services for administration and logistic support. In Vietnam there were varying solutions to the problem of how contractors should be supported, but these evolved on a case-by-case basis without prior determination of overall policies and guidance.

In conjunction with utilizing engineer troops to the utmost, planning and peacetime manning/funding should provide for an adequate

engineer troop force in being, or provisions should be made for rapidly mobilizing engineer reserve units to provide the necessary force. This should be done to prevent the excessively long delay experienced in getting substantial amounts of engineer forces and equipment to RVN. In addition to providing sufficient troop units in being, arrangements should be implemented to insure adequate training programs for these units, particularly in CONUS, where current legal restraints and interpretations in many instances prohibit meaningful training in construction skills.

Regardless of what contractor/troop mix is finally evolved, another major lesson to be applied in any future conflict is to employ self-help, local labor and local materials to the optimum, so as to reduce the requirements for U.S. furnished, skilled construction manpower and relatively expensive construction materials.

Concerning coordination and control, the Military Assistance Command, Vietnam, engineer staff was initially inadequate to carry out full coordination and priorities responsibilities that had been delegated to the Commander, U.S. Military Assistance Command, Vietnam. The implementation of a Director of Construction with joint manning provided the required emphasis at a level commensurate with the importance of the construction programs. The experience in Vietnam has shown that such a director should be immediately under the command or part of the staff of the joint commander in the theater of operations to insure effective and responsive coordination of the construction program with operations and logistics support. Also, the ever-changing demands for

detailed management information and differing formats for reporting dynamically changing programs imposed a heavy workload on the construction managers and responsible commands in Vietnam, and highlighted the need for simplified, comprehensive reporting systems, readily adaptable to ADP assistance.

In the areas of programing and funding, the need for flexibility was duly recognized by the Services and the unified commander, but the extent to which it was provided prior to 1966 was negligable. Further, the modifications thereto, promulgated early in 1967, essentially reverted to peacetime procedures, and imposed an undue and monumental paper workload, and were not commensurate with command responsibilities. Also, sufficient funds were not provided in a timely fashion. The appropriated amounts, particularly prior to the FY 66 S program, were below the required and requested level. The RVN situation showed that, when the level of construction funds must be reduced, the reduction should be exercised through allocation control rather than by means of reduced appropriations requests.

There was little resemblance between facilities originally programed and those ultimately constructed. The early preparation of the program by line item, months before the start of construction, accordingly resulted in the constant requirement to reprogram. Substantial effort was expended to formulate the initial programs in great detail; much of this detail was of questionable value. Gross requirements programing would certainly have been more responsive and effective.

Further, the unmodified application of the full-funding concept precluded the full use of the construction capability that had been mobilized.

In summation, the programing and funding procedures employed to control construction in Vietnam were essentially peacetime procedures which were inappropriate for such a contingency. They did not provide commanders with the degree of flexibility required by and commensurate with their responsibilities. The experience in Vietnam clearly demonstrated the need for simplified procedures.

Concerning the logistics situation, the construction stocks in-theater and in the continental United States were inadequate to support the buildup in 1965. The main causes were insufficient forecasting for and limited procurement of the General Mobilization Reserve Stocks. Construction of essential water and air terminals would undoubtedly have been enhanced had long lead time materials for these terminals, such as prefabricated piers and airfield landing mat, been prepositioned well forward in the theater. In this regard, the establishment of an advanced base depot in the western Pacific (outside Vietnam), with adequate shallow draft lighterage, would have provided balanced and timely provisioning by permitting the "call forward" of materials on an "as needed" basis and would also have precluded the discharge of low priority bulk cargo at RVN ports at other than periods of low activity. Construction materials are unique, in that, while bulky as are Class I, III and V cargo, they are not generally consumed at a determinable rate. Therefore, the scheduling of bottoms is difficult, and the use of airlift is usually impractical. Also impacting unfavorably on the engineer mission was the introduction into RVN of many diverse

makes and models of construction and utility equipment (particularly electric generators). This situation arose because standardized items of military equipment had not in all cases been established and, at the onset of the buildup, it was thus necessary to purchase any item of commercial equipment that was available. The impact of this practice was evidenced in maintenance and repair parts supply problems. Additionally, the situation was aggravated by inadequate initial spare parts provisioning. These Vietnam experiences demonstrated that, when standardized items of critical military construction and utility equipment are not available or appropriate, a program should be established to standardize available commercial items.

Regarding real estate acquisition, the failure of most base development plans to adequately address real estate requirements complicated this issue; however, procedures established by the Government of the Republic of Vietnam were the major cause of problems in timely real estate acquisition. The absence of a "country-to-country" agreement — or draft real estate agreement — in support of the RVN contingency plans impaired expeditious real estate procurement. Also, because of the rapid and unpredictable nature of the buildup of forces in RVN, it was difficult to predict accurately real estate requirements and locations. This further complicated the problem of properly staffing sections to handle real estate processing.

In the area of responsiveness, on an overall basis, the construction accomplished in Vietnam was responsive to operational requirements. However, a substantial backlog of work existed throughout the conflict. This in turn meant that much important lower priority

work was deferred or not done. It is questionable whether a construction force large enough to insure a consistently small construction backlog would be mobilized under most war conditions. In fact, the establishment of such a large construction force would probably be an unwise distribution of available resources. However, improvements made in the fields of gross requirements planning, gross requirements programing, and level of effort funding should lead toward a more nearly ideal balance between total requirements and the construction effort available. Another lesson learned was that the elaborate procedures that were employed to request construction and have it approved, funded, and built contributed markedly to the lag between recognition of a requirement and construction of a facility.

One of the key factors affecting user satisfaction in Vietnam was the degree to which organic capabilities to accomplish construction existed. Although centralized control of construction resources provides efficient overall management of a construction program, commanders need to retain some organic capability to accomplish small construction projects essential to the performance of their mission. In the absence of such a capability, an enormous number of requests for small projects must be processed through already saturated administrative channels with the result that much of the small, urgent work simply cannot compete with larger projects of interest to the higher levels of command for the limited construction effort available.

A need was demonstrated for the early specification of construction standards and planning factors by the commander of a unified command and subsequent enforcement of these standards to eliminate many of the

real and fancied complaints of inequitable treatment, particularly when units from different Services are collocated. A requirement was also established for consideration, during contingency planning, of the manner in which the Army's responsibility to provide troop construction support to the Air Force is to be discharged.

The principal lessons learned during the Thailand buildup re-emphasized the importance and necessity of having an adequate staff, not only to plan properly for construction, but to inspect the work as it is going in and to enforce established policies and construction standards and criteria. Also, the need for proper and timely real estate coordination with the host country government was forcefully brought home.

Experience in Korea after the Pueblo Incident highlighted several important aspects of construction planning, preparedness and execution. First, it demonstrated the feasibility and practicality of augmenting in-country engineer staffs with additional technical expertise in the base development planning area to facilitate establishment of efficient procedures and workable plans prior to the initiation of hostilities. Secondly, it graphically demonstrated the speed with which large quantities of pre-engineered, prefabricated, modular structures could be employed in support of new troop deployments, and how inexperienced troops could be used, with a minimum of training, to erect their own living quarters.

STATUS OF CORRECTIVE ACTIONS AND INVESTIGATIONS, AND CURRENT DOCTRINE

As a result of the recent experiences of the United States in planning and executing base development in support of contingencies, numerous studies and investigations have been conducted on various aspects of base development planning and the accomplishment of construction, many of which were directed by the JCS. The most notable among these are Major General Daniel A. Raymond's, Observations on the Construction Program, RVN, 1 October 1965 through 1 June 1967; the Report by the Special Military Construction Study Group, 19 July 1968; and a report by the Joint Logistics Review Board, Logistic Support in the Vietnam Era, Monograph 6, Construction. All of these references have been drawn upon heavily in the preceding Chapters. As a result of conclusions and recommendations contained in these and other studies, certain actions have already been implemented which should improve the Armed Services' ability to support future contingencies in the area of construction, and other improvements are in various stages of development. This section will review notable improvements which have been instituted and the status of current doctrine.

CORRECTIVE ACTIONS AND INVESTIGATIONS

As a result of DOD's experiences in SEA, the Commander, U.S. Forces, Korea, was provided authority in late 1968 to exercise strong, centralized movement and direction for his on-going construction program in Korea. A Director of Construction was established, and promises

every chance of success. Further, in the DOD published guidance based upon lessons learned in SEA, to be discussed in greater detail later, a central organization and control such as employed in Vietnam was advocated for any future limited buildup situation such as that in Thailand and Korea.[1]

Following joint consideration of the recommendations of the Special Military Construction Study Group, the Joint Chiefs of Staff (JCS) initiated a number of steps to improve contingency plans with regard to base development planning so as to provide for:

1. Increased emphasis on base development at all joint commands and in the Services.

2. Increased involvement in requirements validation by the joint commanders.

3. Improvement in joint headquarters staffing for base development planning.

4. More study toward development of an improved planning and execution system aided by automatic data processing methods.

5. Improvement in the base development plan review process.

6. Establishment of a Joint Staff/Services Board to exchange information and ideas regarding the results of Service functional component and retrievable concept research and development programs and to formulate construction standards and planning factors for adaption to various contingency situations.

Specific actions taken included specifying that in all operations planning, the base development plan be included as an appendix to the

---

[1] Comptroller General of the United States, Problems in the Administration of the Military Building Program in Thailand, Report to Congress, General Accounting Office: Washington, D.C., June 12, 1969, pp. 1-2.

logistics annex. The J-3 (Operations) and J-4 (Logistics) of the Joint Staff were directed, in coordination with the Services, to review contingency plans and base development plans of the unified commands. Also, on June 4, 1969, the JCS established the Construction Board for Contingency Operations. The responsibilities of this board include:

1. Exchange of information regarding results of Service functional component and retrievable concept research and development programs.

2. Examination in detail of the use of pre-engineered units which can be relocated and retrieved.

3. Development of proposed construction standards and planning factors adaptable to various contingency situations.

The JCS specified that reports regarding the results of meetings, conclusions and recommendations were to be regularly forwarded to them.[2]

On October 1, 1969 the JCS promulgated instructions to the unified and specified commands for preparation of base development plans as part of the joint operations planning process. These guidelines are contained in JCS Staff Memorandum 643-69, Instructions for Base Development Planning in Support of Joint Contingency Operations. Highlights of the memorandum are:

1. It specifies that a format, adaptable to ADP use, is to be used by all without alteration. This format was later standardized under Change 2, JCS Pub 3, November, 1969.

2. Unified commander responsibilities are specific. These commanders are charged to prepare base development plans and to provide enumerated items of guidance, as needed, for subordinates. Also, they must insure that engineer intelligence requirements are incorporated in the Consolidated Intelligence

---

[2] U.S., Joint Chiefs of Staff, Logistic Support in the Vietnam Era, Monograph 6, Construction, A Report by the Joint Logistics Review Board: Washington, D.C., October 12, 1970, pp. 40-41.

Program, and they are required to keep current files on existing facilities, soils, terrain, climate and other factors that influence construction capability within their area.

3. With regard to the responsibilities of the Services, the instructions say: "Implementing directives will be published by the CINCs to specify the procedures for participation of their Service Components in the base development planning required, since the detailed base development planning is a responsibility of the Services".[3]

4. Planning factors, construction standards and use of ADP are highlighted. Also, provisions are made for inclusion of real estate requirements in base development plans (an expansion of data contained in the U.S. Base Requirements Overseas Report), and for the development of procedural plans as an initial step in preparing real property negotiations folios to be used when appropriate.[4]

This system has not been exercised much as yet, and therefore, it is too early to assess its value.[5]

Another group which should have an enormous impact on construction planning and execution within all the Services is the Joint Logistics Review Board (JLRB). The Secretary of Defense recommended to President Richard Nixon the formation of a study group of this kind. The recommendation gained Presidential approval and the JLRB was formed on March 7, 1969. The Board was tasked to study the worldwide logistics support provided from 1 January 1965 to the present — the Vietnam Era. The primary mission of the Board was to identify strengths and weaknesses of the various logistics systems and procedures of the Services. It was to document the logistics lessons learned from the

---

[3]U.S., Office of the Joint Chiefs of Staff, <u>Instructions for Base Development Planning in Support of Joint Contingency Operations</u>, SM-643-69, October 1, 1969.

[4]<u>Logistics Support in the Vietnam Era . . .</u>, <u>Op. Cit.</u>, p. 140.

[5]<u>Ibid.</u>, pp. 41-42.

Vietnam conflict and determine those that might have appreciable effect on future military operations.[6] Under its terms of reference, the JLRB was directed to give particular attention to the functional area of construction.[7] The Board, under the chairmanship of General Frank S. Besson, Jr., has completed its investigations and issued a comprehensive report (2,750 pp.) consisting of 21 separate documents which contain 261 recommendations for increasing efficiency and economy in logistics. The report is now being studied by the Subcommittee on Military Operations (the Holifield Committee) of the House of Representatives.

In presenting the Board's report to the Holifield Committee, General Besson singled out 15 of the recommendations as "major". Among these was the need for "Coordinated in-theater construction programs". Other "major" recommendations made by the JLRB which materially impact on construction were:

1. Reduce requirements for in-country logistics resources.
2. Exploit containerization.
3. Reduce and control excesses.
4. Establish criteria for common supply overseas (including selected construction materials).
5. Improve logistics planning.
6. Assign top-level logistics managers early.
7. Balance the force structure.

---

[6] "The Joint Logistics Review Board", Army Logistician, 2, No. 4 (July-August 1970), 8-11.

[7] U.S., Department of Defense, Joint Logistics Review Board, Office of the Secretary of Defense, Memcrandum, February 17, 1969.

8. Balance the transportation capability.

9. Deploy ADP equipment early.

10. Plan joint logistics responsibilities.[8]

As already mentioned, the Board findings are currently under study, and one can only conjecture as to what the final impact of the Board on the logistics procedures and organizations of the Services and joint commanders will be.

The Services are actively engaged in developing improved systems for base development planning and execution, e.g., the Navy's STINGER ADP system, which will be discussed in considerable detail later in the Chapter.

The Air Force has developed a "bare base" concept which is built around an easily erectable, relocatable group of pre-engineered, prefabricated structures suitable for use in any climatic environment. During its deliberations the JLRB viewed one Air Force demonstration of this concept in action, and was so favorably impressed that the Board, in December 1969, forwarded a memorandum to the JCS and DOD praising the concept for its mobility and ability to respond promptly to contingency requirements.[9] This concept will also be investigated in more depth later in the Chapter.

Having accumulated the overwhelming bulk of recent base development experience in Asia, and consequently having also had a major share of the problems, the Army seems to be doing more revamping of existing

---

[8] "The Joint Logistics Review Board Findings", Army Logistician, 2, No. 6, (November-December 1970), 10-13.

[9] "The Joint Logistics Review Board", Army Logistician, Op. Cit., p. 10.

procedures and systems than the other Services. Like the Navy, it is also doing extensive work on ADP systems suitable for BDP. Further, it has recently published a final draft of a completely new base development manuscript, incorporating many of the recent lessons learned. This document, FM 31-82 (Test), Base Development, February 1971, is destined to form the backbone of the Army's base development doctrine, and will be examined later in the Chapter, along with the doctrines of the other Services.

In late February 1971, the Chief of Staff of the Army issued a memo for the heads of Army staff agencies, in which he directed the establishment of an Army board to examine the concepts and life cycle systems for base development within DOD, beginning with the recognition of an enemy threat, through retrieval, relocating or disposal of units or components; to determine the adequacy of existing systems; and to provide fresh policy and directives as deemed necessary.

In commenting to the DCSLOG concerning the above memo, the Chief of Engineers, on April 3, 1970, emphasized the need for increased emphasis at all command levels and more rapid progress in BDP, in determining requirements, in modernization of on-hand components, and in introducing new prefabricated, pre-engineered, prepackaged components. He identified the Army problem as having too few qualified personnel available to do the job, and also having too few planning tools available; the result being continual planning by the Office, Chief of Engineers (OCE), with little participation by the planners in the field. At this time he also proposed that the Engineer Strategic Studies Group (ESSG), of OCE, be used as the Army's central office for BDP, with a mission to

support the Army by drafting Army components' plans, and as required, joint base development plans, for Army components of the unified/specified commands. This proposal was accepted and at this time ESSG was also assigned the mission of conducting a comprehensive ADP study for the Army. This study should be available shortly.

The General Staff determined the BDP issue had broad ramifications, ranging from political and strategic impacts through tactical operations. As a result, the formation of a board to study these problems was directed.

Last fall, the Department of the Army (DA) established the Army Base Development Board to review the present support for contingency operations.[10] Chief of Staff Regulation Number 15-24, Boards, Commissions, and Committees, "Army Base Development Board", October 14, 1970 established the Board as a continuing committee and charged it with the missions of evaluating: concepts, management systems and supporting material systems for base development within DA. The Board is to determine the adequacy of the current organization, issue missions and establish necessary staff responsibilities, and insure that base development support of the Army for future contingencies is effective and responsive. Specifically, the Board is to:

1. Evaluate contingency planning procedures with emphasis on BDP and DA staff responsibility for the review of plans proposed by unified and specified commands.

2. Evaluate BD concepts, procedures and responsibilities and develop recommendations on appropriate staff relationships for each aspect of BD.

---

[10]"The DA Base Development Board", Army Logistician, 3, No. 1 (January-February 1971), p. 37.

3. Verify assignment and documentation of responsibilities within DA and identify any need for clarifying implementing instructions to major commands.

4. Review current responsibilities within DA for development and modernization of pre-engineered facilities than can be used for support of BD and recommend redefinition of responsibilities as required to assure orderly and progressive modernization of the functional facilities system for support of contingency operations.

5. Review current responsibilities and procedures with DA for training and instruction on BDP at Service schools and recommend necessary revisions of school responsibilities to permit development of timely and more meaningful plans at all staff levels.

6. Serve as the Staff Advisory Group (SAG) (AR 1-5) for those studies on BD which fall within the purview of the Board.

7. Establish procedures for exchange of BD information among interested DOD components, the Army Logistic Policy Council, the Joint Staff/Services Construction Board for Contingency Operations and appropriate Army elements.[11]

The first meeting of the Board was on November 13, 1970 at the Office of the Deputy Chief of Staff for Logistics. At this meeting, several critical deficiencies, previously touched upon by other study groups, were identified. They were:

1. An urgent need for improved base development planning within the Army.

2. A critical requirement for pre-packaged, pre-engineered, modular facilities based on more accurate current requirements.

3. The need for a system for prestocking critical, long lead time materials.

It was also decided at this meeting to use the resources of the Engineer Strategic Studies Group to assist the Board in doing its job.[12]

---

[11] U.S., Department of the Army, Boards, Commissions, and Committees, "Army Base Development Board", Regulation No. 15-24, Office of the Chief of Staff: Washington, D.C., October 14, 1970.

[12] "The DA Base Development Board", Army Logistician, Op. Cit., p. 37.

The Army Base Development Board has continued to meet on approximately a monthly basis. Thus far, most of the action seems to center about ESSG, which is beginning to make some progress in exercising its responsibilities as the Army's central repository of base development information and expertise. ESSG appears well suited to this role, being the principal analytical source of OCE. It has conducted and participated in a wide range of studies for DA, the JCS and DOD. ESSG has a pool of experienced, qualified Army planners, free to give full time attention to BD problems. It also has access to dedicated ADP hardware and comprehensive supporting ADP software to assist in conducting BDP. It became involved with BDP in 1967 hen it prepared initial BD planning guidance for the Army.

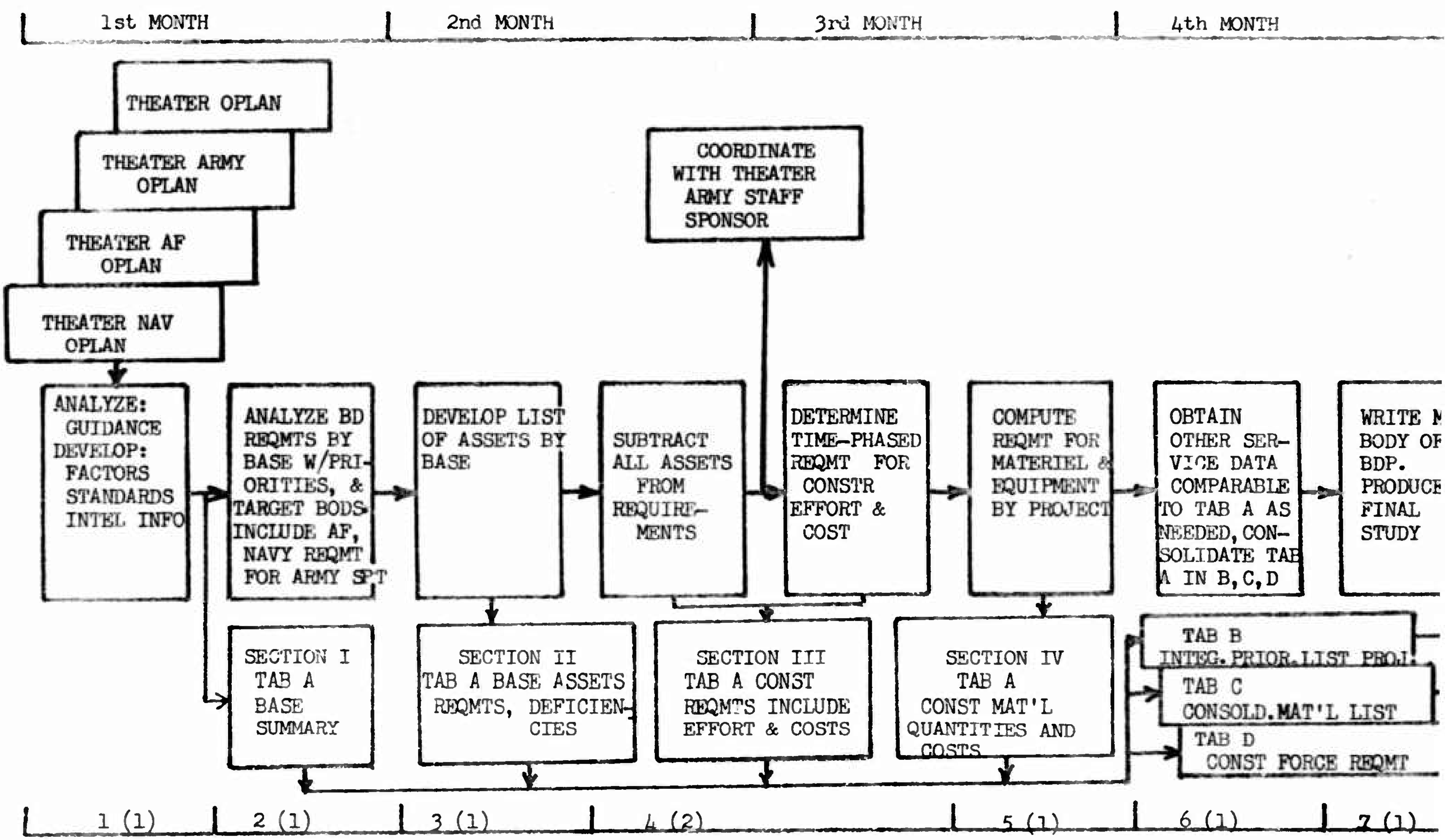
Following the Joint Committee Study in 1968, ESSG was instructed by DA to assist Army component planners in improving the BDP process. Working closely with the Army Base Development Board and Army component planners in the field, ESSG is now completing at least one BDP per theater to help theater planners get started on their BDP. The Group has undertaken adaption of ADP to assist BDP, which has resulted in significant savings in plan preparation time. Figure 7 shows the BDP process currently being followed by ESSG. In addition, ESSG is turning its attention to analysis, review and support actions of the Army staff. ESSG is also seeking a DA level organization to give full consideration to BDP in Army-wide programing, planning and budgeting.[13]

---

[13] John P. Chandler (Col., U.S.A.), The Engineer Strategic Studies Group, Paper, Engineer Strategic Studies Group: Washington, D.C., December 17, 1970.

In addition, ESSG has been busily developing Gross Planning Factors keyed to appropriate DOD Category (DOD Cat Code) numbers, used to determine construction requirements for installations and facilities. These planning factors are being developed from published criteria and theater experience, such as consumption factors (see Table 6 for an example of European Theater Consumption Factors). Emphasis is being placed on minimum essential facilities. An in-depth analysis is made of each factor prepared. This analysis is directed toward the establishment of a firm overall basis for determining theater requirements. Tests are constantly being conducted to determine the most appropriate and definitive planning factors for application to a specific DOD code. Examples of some recently developed planning factors are contained in Table 7.

In addition to the foregoing actions the Army is also in the process of revising its functional components system. The proposed system will be discussed in detail later in the Chapter, in conjunction with the functional component systems and concepts of the other Services.



ORDER OF PRODUCTION (NO OF M/MO)
(TYPING CONCURRENT)

FIGURE 7

BASE DEVELOPMENT PLANNING PROCESS

Source: Chandler, Ibid.

Table 6

CONSUMPTION FACTORS (LB/MN/DY)[1/] (U)

(Used as a basis for DOD Cat Codes 410, 430, 440, 450)

CLASS	US Army	US Air Force	FRG Army	FRG Air Force	ALLIED Army	ALLIED Air Force
I (Reefer)	1.18	2.10	1.18	1.80	—	—
(Nonreefer)	5.05	4.90	5.05	4.90	5.50	5.50
II	7.04	2.36	1.84	1.18	.50	.50
III (PKG)	4.52	20.61	3.60	16.40	3.60	16.40
(BULK)	47.80	32.10	30.60	25.60	30.60	25.60
IV	3.30	9.78	1.36	11.30	1.36	11.30
V	31.02	22.30	24.86	18.30	24.86	18.30
VI	4.50	4.50	2.20	2.20	2.20	2.20
VII	4.35	1.17	3.02	1.17	1.70	—
VIII	.30	—	.21	.30	—	—
XI	3.27	.36	1.09	.36	.65	—
X	5.90	—	—	—	—	—
TOTALS	118.23	100.18	75.01	83.51	70.97	79.80

[1/]Based On:
1. DA, ACSFOR, Force Planning Guide — Europe.
2. Office of the Adjutant General, Implementation of Supply Categories, Materiel Classes of Supply, Ltr, file AGAM-P(M).
3. FM 101-10-1.

SOURCE: Chandler, Ibid.

Table 7

PLANNING FACTORS FOR COMPUTATION OF PERCENT

OF OPEN/CLOSED STORAGE (U)

	Percent of Stocks[a]			Gross Storage Factors[b] (SF/ST)	
Class of Supply	Covered	Open	Cold	Covered & Cold	Open
Subsistance				16.67	28.4
"A" Rations					
Refrigerated	—	—	100		
Nonrefrigerated	60	40			
"B" Rations	60	40			
"C" Rations	60	40			
Clothing, Indiv & Admin Equip	50	50	—	16.67	28.4
POL	—	—	—	—	—
Bulk					
Air					
Ground					
Packaged	3	97	—	16.67	28.4
Construction	10	90	—	16.67	28.4
Ammunition	10	90	—	14.00[c]	14.00[c]
Personal Demand	90	0	10	16.67	—
Major End Items	15	85	—	16.67	28.4
Medical	80	10	10	30.00	30.0
Repair Parts	58.4	40	1.6	16.67	28.4
Non-Military	50	50	—	16.67	28.4

a/ Source: FM 101-10-1.
b/ Source: AR 780-5, FM 101-10-1, and theater experience. Stack height is 8 ft for covered and cold storage and 6 ft open storage. Class V factors are for conventional ammunition.
c/ Air Force - 19 SF/ST.
Source: Chandler, Ibid.

JOINT BASE DEVELOPMENT DOCTRINE

In December of 1968, the Department of Defense, through the Office of the Deputy Assistant Secretary of Defense for Properties and Installations, published a manual providing information, policies and guidelines to assist in the planning and execution of base development in overseas areas during contingency operations.[14] A substantial portion of the contents reflects experience gained in Asia during the period 1965-1968. The manual provides general planning guidance on the development of construction requirements; procedures for program submission; considerations in resource selection; construction program execution; use of functional components; estimating costs, funding the construction program, and managing the funds provided; reporting systems; and base development considerations in a highly mobile, general war type of environment. Numerous examples of procedures, controls and administrative processes utilized in SEA and Korea have been included as appendices.

Specifically, in the area of planning, DOD guidance advocates strong and continuing command emphasis, particularly at the Unified Command, Service Component and Joint Chiefs of Staff levels. It emphasizes that the base development process will command a significant share of the total logistic resources available in an area of operations both during the lodgment and buildup phases, and to a lesser extent throughout the duration of the operations. It stresses the essentiality

---

[14]U.S., Department of Defense, Base Development for Contingency Operations, Manual, Office of the Deputy Assistant Secretary of Defense for Properties and Installations: Washington, D.C., December, 1968.

of conducting base development planning concurrently, and coequally, with contingency operations planning. The need to prepare BDPs well in advance of an operation and to keep them current is recognized. It reiterates the concept that Service component commanders are responsible for the preparation of BDP in support of their operations, and that joint commanders are responsible for review of these plans and initiation of additional planning as needed. The DOD guidance emphasizes the importance of having adequately manned staffs at all levels to handle base development. It also emphasizes the potential need, in a rapidly accelerating area of operational interest, to form a team of experienced personnel, under the control and supervision of the joint commander, to assist the BDP efforts of existing staffs. Finally, it reiterates the fact that the Secretary of Defense has designated contract construction agents for selected geographical areas throughout the world (See Table 8). Each of these agents has the full and sole responsibility for accomplishing DOD contract construction in his area of responsibility. The DOD guidance considers it desirable that these construction agents participate in base development planning because of their knowledge of contractor capabilities, materials and equipment resources, and existing facilities in their areas, and because of the advance knowledge they will gain of construction requirements that may be placed on them.[15]

In the field of construction standards DOD guidance indicates that the joint commander should formulate uniform quality standards for all Services, following the basic principle of providing the required

---

[15] Ibid., pp. 1-2 through 1-4.

facilities at the least cost in resources, based on the expected duration of use. It suggests three possible categories, Transient, Intermediate and Fixed (See Table 9 for a definition of these categories), based on standards finally adopted in RVN. The guidance emphasizes that programed costs and subsequent funding for like items needed by two or more Services, such as troop housing, should be at the same unit cost allowance for each Service, and the requirement to fully substantiate the need for any exceptions to this policy. It also reminds commanders that standards developed for a theater are subject to prior approval by the Secretary of Defense, and leaves it to joint commanders to routinely develop standards as part of their base development planning.[16]

Regarding the use of functional components, DOD recognizes that one of the steps necessary to more efficient construction support of contingency operations is increased use of prefabricated and prepackaged components that have been stocked prior to the contingency or may be readily available from commercial sources. It also specifies the policy of DOD that a maximum of facility requirements in an area of contingency operations be met through the utilization of these components. DOD guidance goes on to list the various anticipated advantages of functional components; describes the Service's functional components systems (to be examined in detail later in the Chapter); stresses that functional components should be considered for the broadest spectrum of requirements, and are most appropriate for requirements which are repetitive in nature, significant in numbers, and applicable to use by two or more services. It also lists what it considers the desirable characteristics of functional components for construction:

---

[16] Ibid., pp. 2-5 and 2-6.

Table 8

DESIGNATED DEPARTMENT OF DEFENSE

CONSTRUCTION AGENTS

Corps of Engineers - Department of the Army

Azores
Canada (excluding Newfoundland)
Europe
Greenland
Iran
Japan
Korea
Marshall Islands
Middle East
North Africa (From Morocco to Somali Republic)
Southeast Asia (West from Western Borders of Laos and Thailand)
Pakistan
Ryuku Islands
Taiwan
Turkey

Naval Facilities Engineering Command - Department of the Navy

Bermuda and Caribbean Area
Cambodia
Iceland
Indian Ocean - Australia - New Zealand Complex
Johnson, Midway and miscellaneous Pacific Islands
Laos
Mariana Islands
Newfoundland
Philippines
Spain
Thailand
Vietnam

Department of the Air Force

United Kingdom

Source: Base Development for Contingency Operations, Ibid.

Table 9

DOD SUGGESTED CONSTRUCTION CATEGORIES

TRANSIENT

For units and activities whose missions require that they move frequently. These facilities would be provided on a minimum basis, consisting of little beyond those which can be established using organic (field) equipment.

INTERMEDIATE

For units and activities which can be expected to move at infrequent intervals, e.g., annually, in which case some facility improvement beyond that which can be accomplished with organic equipment is warranted.

FIXED

For units or activities which can be expected to operate from a stable facility for the duration of hostilities, thus warranting a relatively long term degree of facility life.

Source: Base Development For Contingency Operations, Ibid.

1. Mobility and durability consistent with the function to be performed.

2. Standardization and uniformity among the Services.

3. Commercially available off-the-shelf items to the maximum extent.

4. Flexibility to satisfy both forward area and base requirements, with consideration given to differences between those requirements.

5. Economically recoverable for use at other locations.

6. Adaptability to use in multiples to meet a range of requirements.

7. Minimum construction requirements.

Regarding prestockage, DOD guidance is that, to the extent authorized and consistent with the considerations of obsolescence, deterioration, production time and minimum essential initial requirements, selected functional components should be prestocked by the military departments and appropriate supply agencies, or be assigned to units designated for deployment in contingency situations. Stockage levels should be tied directly to approved contingency plans. For those items for which prestockage is inadequate, current information necessary to initiate procurement should be maintained to include specifications, drawings, procurement sources, availability and other essential data. In addition to prestockage, DOD recommends that a program to provide for continuous evaluation and availability of commercial items should be undertaken.[17]

Regarding the preparation and submission of a construction program in support of a major contingency situation characterized by

---

[17]*Ibid.*, pp. 6-1 through 6-5.

activity of relatively long term duration in an essentially fixed area of operations, DOD policy still visualizes a relatively tightly controlled, total funding type program. DOD sees the Military construction program for this type operation as normally including:

1. An analysis and summary of facilities requirements.
2. The scope, justification and cost estimates for the program defined on DD Forms 1390 and 1391 by facility classes and category groups for each Service.
3. A supporting analysis of the relationship of the program to be executed and the capability to be provided for execution, in relation to the requirements time frame.[18]

In executing the construction program, DOD stresses that in an area of operations involving two or more Services, it is essential that the total of all requirements be considered as an integrated program, and that its execution be placed under joint direction and control at the joint level in-country. DOD recognizes this arrangement as necessary to provide for the allocation of resources, the establishment of priorities, the necessary cognizance of area-wide requirements, the elimination (or reduction) of competition and duplication, the application of area wide standards and criteria, continuing coordination of all construction agencies, and the development of management information. DOD advocates authorizing the joint commanders directive authority and centralized control over all DOD construction commands and agencies, both military and civilian, except for those engineer units organic to or assigned to major combat units. DOD also visualizes that the functional areas of authority within the control/direction agency of the joint command

---

[18] Ibid., p. 3-1.

will include program development, fiscal management, reports, construction management, plans and operations, resources control, real estate, and of course, base development planning. In executing the program DOD specifies that, depending on the situation, any and all of the following personnel resources might be used.

1. Engineer troops
2. Military self-help
3. Indigenous labor
4. In-country contractors
5. U.S. (or third country) contractors

The DOD guidance addresses the fact that if contractors are used extensively, they will absorb a significant portion of the materiel, transportation, equipment and labor capability available to the theater, and will require some very hard decisions to be made regarding troop/contractor mix.[19]

DOD recognizes that total requirements will far exceed execution capabilities for a long time, thus requiring a priority system to insure that the most critical needs of the theater are met early. DOD recommends establishment of priorities at the joint command level, and use of broad categories as follows:

1. Operational and logistical facilities
2. Personnel support facilities including cantonments (only essentials, e.g. shelter, mess and sanitation)
3. Personnel support facilities (those which furnish improved living conditions)
4. Welfare and recreation facilities.[20]

---

[19] Ibid., pp. 4-1 and 5-1 through 5-5.

[20] Ibid, p. i.

In the area of use of ADPS to implement base development planning and execution, Base Development for Contingency Operations gives no specific guidance.

The DOD publication emphasizes only those aspects of the total base development process which experience indicates require clarification or guidance. The manual stresses that it is intended to be advisory rather than directive in nature, and that it does not supplement provisions of existing directives or regulations.[21]

ARMY BASE DEVELOPMENT DOCTRINE

The Army's latest thinking on base development, as summarized in FM 31-82 (Test), Base Development, is, like the DOD guidance, heavily colored by recent experiences in Asia, and is essentially in consonance with the DOD guidance.

The manual prescribes Army doctrine to assist commanders and staff officers in developing a base or bases in a theater of operations. It covers base development from early concept planning to program execution. The manual defines the roles, interrelationships, and functions of the various levels of command and support involved in base development in support of general war and contingency operations. Levels of command addressed in FM 31-82 (Test) include the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, the unified and specified commands, the component commands, and subordinate joint commanders.[22] The manual provides for an integrated system for

---

[21] Ibid., p. i.

[22] U.S., Department of the Army, Base Development, FM 31-82 (Test), February 1971, pp. 1-1 through 1-3 and p. 2-1.

base development ranging from early concept planning to program execution. It outlines a base development planning system which highlights time phasing of personnel, equipment and material in the proper mix to prevent the inefficiency which occurs when personnel and equipment arrive in improper sequence.

FM 31-82 (Test) outlines the pattern of base development planning guidance, based on DOD doctrine, essentially as described below.

Requirements for overseas bases stem from National policies and commitments made at the highest levels of Government. These bases fall into categories for planning purposes: the peacetime garrisoned bases and the expedient bases which must be wholly or partly constructed after approved OPLANs are ordered implemented. The Secretary of Defense accepts responsibility for these commitments. He, in turn, transmits the broad planning guidance to the JCS. In consonance with this guidance, the JCS issue policy guidance and mission directives to unified or specified (theater) commanders. Theater commanders are guided in base development planning not only by mission directives but also by the following documents published annually by the JCS:

1. Joint Strategic Objectives Plan (JSOP), which is the basic document against which continuing military recommendations on individual force level actions and related strategy can be compared.

2. Joint Strategic Capabilities Plan (JSCP), which outlines the strategy to support National policies and objectives based on capabilities.

3. United States Base Requirements Overseas (USBRO), which summarizes current U.S. oversea base requirements.

4. JCS Pub 3, which describes basic policy, establishes procedures and defines responsibilities for providing an integrated base development system for joint contingency operations (not published annually but revised as needed to keep current).[23]

The manual describes planning procedures, again in consonance with DOD directives, as being categorized into two general phases, each culminating in a specific document. These documents are:

The Base Development Planning Directive. When detailed planning for an operation begins, the theater commander issues a base development planning directive. This directive is transmitted to the appropriate subordinate commander(s). The directive is based on the operational concept and the force structure. It includes selected base sites, assigned support missions, operational target areas, preliminary estimates, and instructions required for specific planning. As a minimum, to insure inter-Service coordination and to reduce competition, the following are normally provided to the appropriate subordinate commander(s) early in the preparation of base development plans. The directive has no prescribed format, but may —

1. Allocate responsibilities to the component Services for projects and functions.

2. Specify priorities and completion dates for projects.

3. Specify construction standards.

4. Allocate facilities and real estate to subordinate commands.

5. Indicate the command structure and designate the commander(s) charged with base development.

6. Indicate the scope and magnitude of the logistic support capabilities of the base.

7. Specify standing operating procedures and directives to govern operations of the plan.

---

[23] Ibid., p. 2-2.

The Base Development Plan. The base development plan is the product of concurrent planning by the Commander of a joint command and the commanders of the component Services accomplished in accordance with the planning directive. It is the governing instrument for planning and establishing a base. The plan is a compilation and extraction of all the information needed for the theater commander and his staff to coordinate the efforts of subordinate commands in base development. It provides specific terms of direction and includes all phases of concurrent planning undertaken by the subordinate commands concerned. The base development plan sets forth the base facilities to be provided and the combat service support functions to be performed. It covers such matters as standards of construction, priorities, and restrictions on use of critical materials. The theater commander compiles and publishes the plan. The BDP should be included in the logistic annex to the OPLAN.[24]

The manual also gives extensive guidance, patterned after the already discussed DOD guidance, on how the Army should conduct base development when its interest is exclusive or predominates and a joint command has not been established. Further, it highlights how to prepare a detailed base development plan, and gives an elaborate example, based on the format prescribed by Change 2 to JCS Pub 3, November 1969.

FM 31-82 (Test) contains a detailed sequence of events for executing a base development program. The exact point when execution of a contingency operation plan (OPLAN) would be declared is hard to

---

[24]Ibid., pp. 2-2 and 2-3.

predict. The requirement for execution may be clear cut as the result of an overt attack on U.S. or friendly forces, or it may occur as the result of an incremental response to an insurgent action. After the decision to execute an operation is made at the National level, specific directives given to the Joint Chiefs of Staff (JCS) will include guidance needed to define the limitations and level of effort required. Combat Developments Command prepared doctrine visualizes that the sequence of events involved in base development execution would proceed essentially as follows:

The JCS coordinate Military Department actions to implement the OPLAN most appropriate to the situation. The JCS evaluate the situation considering the current base development plan (BDP), military posture, materiel resources, and other pertinent factors. From this evaluation, they make the necessary decisions and provide authority to execute the OPLAN to the theater commander. The JCS allocate and reallocate resources from other theaters to support the OPLAN. The Military Departments, in coordination with the JCS, prepare the initial funding requirement and forward it to the Secretary of Defense for approval and submission to Congress.

The theater commander, on order from the JCS, orders the approved OPLAN into execution. After having reviewed the BDP for adequacy and adjusting in-being resources, the theater commander then tasks a subordinate commander for implementation. The subordinate commander may be a joint force commander or a Service component commander whose interest in the area of operations is exclusive or predominant.

The subordinate commander then —

Utilizes his base development planning staff to supervise the implementation of the BDP.

Reviews the BDP for adequacy and makes any necessary revisions.

Orders the execution of the approved OPLAN and BDP.

Adjusts in-being resources.

Controls all base development resources and allocates resources as dictated by an updated evaluation of the situation.

The joint command Service components and the DOD-designated construction agent conduct construction operations under the operational control of the joint command commander. The construction agent operates within his component Service channels for contract management.

On direction to execute the OPLAN, the Military Departments prepare and submit to the Secretary of Defense funding requirements for the <u>initial</u> construction necessary to support the updated contingency plan. Simultaneous with the development of budget programs, Military Department resources in-being are made available to the theater commander as directed by the JCS. Base development forces are made available, existing war reserve stocks are released, and construction capabilities are marshaled.

The Secretary of Defense reviews and approves the Military Department programs and submits them to Congress for special legislation to support initial requirements. Construction requirements are expressed in terms of a level of construction capability based on gross facility requirements. On receipt of Congressional authorization and funding, the Secretary of Defense —

Passes the military construction program (MCP) to the theater commander via the JCS.

Releases funds and all other authorizations to the Military Departments.

On receipt of the military construction program authorization from the Secretary of Defense, the JCS review the program and pass it on to the theater commander. The JCS authorize the Services to release any newly created resources to the theater commander in accordance with the review of the updated BDP.

On receipt of authority and funds from the Secretary of Defense and the JCS, the Military Departments take the following action:

Identify any shortfalls which resulted from inadequate funding or deletions made during the budgeting process and initiate any necessary reclama actions.

Allocate military construction program funds to the in-theater DOD designated construction agent.

Take necessary action to activate or procure those additional resources required to support the contingency OPLAN and BDP. This includes such actions as activating and equipping new construction units, call-up of Reserve units, advertising construction contracts, and procurement of functional component materials.

Release the created resources (except funds) to the theater commander as directed by the JCS.

The theater commander, in turn, allocates the required resources to the subordinate commander (joint or component) charged with the implementation of the base development program.

The DOD-designated construction agent functions within the assigned area of operations as determined by the Secretary of Defense based on recommendations by the JCS. All DOD contract construction in a contingency area will be accomplished by the DOD construction agent responsible for that area. However, on an exception basis, other arrangements for contract construction support may be authorized when such arrangements offer significant advantages. The DOD construction agent is fully responsive to the theater commander and to any subordinate commander charged with base development responsibility in the area of operations.

The joint or component commander tasked with base development controls all assigned construction resources and allocates resources as required. Base development support of the operation is thus implemented and underway in the area of operations.

The program described above provides an initial capability for accomplishing base development. The development of any necessary follow-up is determined by a continual reassessment by the commander tasked for implementation of the base development program. Resource requirements, authorization, and procurement for base development follow-on programs would recycle through the chain of command.[25]

The discussion of functional components in FM 31-82 (Test) essentially duplicates the DOD guidance discussed previously.[26]

Concerning standards of construction, proposed Army doctrine is contained below:

The theater commander promulgates standards of construction to insure uniformity of construction quality throughout the contingency

---

[25] Ibid., pp. 5-1 through 5-4.

[26] Ibid., pp. 6-1 through 6-8.

area for all Services. The basic principle in establishing standards is to provide the needed facilities at the least cost in resources for the expected duration of use. Long-life materials may be used for short-time requirements provided increased costs do not result. While standards are primarily reflected in quality and durability of the completed facility, they have a real impact on living and working conditions; e.g., masonry versus tents for living shelters. Running water and waterborne sewage are included in standards because of their influence on living and working conditions and cost. Categories of standards are based on the military situation, location, environment, anticipated duration of use, latest developments in prefabricated and prepackaged functional components, and cost considerations. As those factors change, a corresponding change in standards may be required. Six standards of construction which have been prestructured into the Army Facilities Component System (AFCS) are identified in the system as follows except for hospitals: (For greater detail and hospital standards, see FM 101-10-1, Chap 7.):

> Standard 1. No construction effort is programed. Units utilize organic equipment and materials. Personnel and facilities are housed in tents. Pit-type latrines are used.
>
> Standard 2. Same as Standard 1, except that construction effort is programed for clearing site, grading of roads, and erection of critical facilities and utilities. Improvements are confined mainly to those made on a self-help basis by the occupying unit using its organic equipment.
>
> Standard 3. Same as Standard 2, except that construction effort and materials are furnished to erect buildings for administrative and other major operational facilities. Water and electrical distribution systems are installed. Roads are stabilized with local materials. There is no waterborne sewage.

Standard 4. Same as Standard 3, except class IV tents with floors and wood frames are provided for housing.

Standard 5. Same as Standard 4, except that buildings are constructed for all purposes.

Standard 6. Same as Standard 5, except that waterborne sewage is installed and all roads are paved.[27]

NAVY BASE DEVELOPMENT DOCTRINE

Navy base development doctrine is summarized in Department of the Navy Publication NWIP 11-23(A), Base Development, April 1967. This publication gives background for planning naval advanced bases, including high level policy guidance and a discussion of the Navy planning and programming system; outlines responsibilities for BDP from JCS-CNO level down to the base civil engineer; and discusses BDP to include the considerations affecting planning procedures, recommended planning procedures, basic planning principles, planning assistance available through the Naval Facilities Engineering Command (NAVFACENGCOM), the base development study, the base development plan and a logistic feasibility review. Further, it discusses the details of base development planning, site utilization, refinement of planning requirements, the Navy Advanced Base Functional Component (ABFC) System, shipment scheduling, and finally, the actual construction of the base.[28]

---

[27] Ibid., pp. 6-8 through 6-9.

[28] U.S., Department of the Navy, Base Development, Publication NWIP 11-23(A), Office of the Chief of Naval Operations: Washington, D.C., April 6, 1967.

Specifically, Navy doctrine centers around the Navy's Advanced Base Functional Component (ABFC) system as the primary BDP&E tool in establishing a forward base. Navy guidance utilizes the following chronological example of operational use of the ABFC system under actual conflict conditions:

Normally, high level planning authority (JCS, NATO and so forth) determines the need for a naval advanced base to support planned or actual strategic operations. This body provides some guidance in delineating the scope and mission requirements of the base. Following this preliminary action, and in accordance with JCS (and other base planning authority) instructions, a base development study is prepared as a result of Chief of Naval Operations (CNO) instructions to the fleet or area commander concerned. After concurrence of the CNO, the base development study is sent to the appropriate fleet or area command for planning consideration and selection of the objective site.

The command next issues a BDP directive addressed to the subordinate commander concerned. This is followed, within the allowable planning cycle time limits, by issuance of the BDP, prepared by the designated planning group and using all available data on terrain, weather, hydrography, existing facilities, economic factors, and any other pertinent information relating to the base site.

The finished BDP, with its included list of required functional components, and a shipment schedule, is sent through the fleet and area chain of command to the CNO for review and evaluation.

Following receipt of approval of the proposed BDP, the fleet or area command will confirm the included shipment schedule by advising CNO of the dates on which specified components will be needed at the base site. Stocking depots and personnel centers are alerted, components are readied, equipment is exercised, personnel are given final training, and all materials are given protection packing for overseas movement. Shipping schedules, previously outlined in the BDP, are reviewed by the cognizant naval activities (CNO, Bureau of Personnel, etc.). Actual ship loading is directed through the shipping authority concerned in accordance with the requirements set forth in the plan. Shipment of materiel and people is coordinated by the respective continental sea frontier commander.

On arrival at the base, the functional component material is off-loaded according to the prescribed unloading priority established in the BDP. Buildup ashore will then proceed in accordance with the supporting base construction plan as prepared by the commander of the construction forces, either as a tab to the area commander's BDP, or as an independent subsidiary plan. At this point, most of the functional components lose their individual identities and the associated men and materials are consolidated to form the advanced base operational facilities.[29]

Department of the Navy Technical Publication, Engineers' Handbook for Planning Navy Advanced Bases, gives planning factors and statistical data required for estimating construction tasked; Department

---

[29] Ibid., pp. 4-7 and 4-8.

of the Navy Publication, Facility Planning Factors for Naval Shore Facilities, also discusses the philosophy of planning factors, and gives pertinent data concerning these factors.[30] However, no Navy publication known to the author specifically discusses standards of construction; it appears that Navy reliance is on extensive use of the ABFC system to maintain appropriate construction standards. Further, no doctrine concerning ADP assisted planning and execution had as yet been incorporated into publications on naval BDP doctrine.

AIR FORCE BASE DEVELOPMENT DOCTRINE

Air Force base development doctrine is primarily contained in three Department of the Air Force publications: AFM 2-40, Operational Concepts and Capability Standards for Mobility, Austere Basing and Support of Tactical Air Forces, September 22, 1967; AFM 86-3, Planning and Design of Theater of Operations Air Bases, Vol 1, January 20, 1967, and Vol II, September 6, 1968; and AFR 88-12; AR 415-30 (joint Air Force-Army regulation), Troop Construction for the Air Force, July 26, 1965.

As with the other Services, Air Force base development doctrine adheres closely to DOD/JCS guidance. As noted in the discussion of the RVN conflict, the Air Force places great emphasis on base development planning and execution, and because of the relative uniformity of its

---

[30] U.S., Department of the Navy, Engineers' Handbook for Planning Navy Advanced Bases, BUDOCKSINST 04040.4A, December 9, 1957, and Naval Facilities Engineering Command, NAVFAC P-80, Facility Planning Factors for Naval Shore Activities, January 1967.

requirements, the comparatively small number of base requirements in a theater of operations relative to the Army, and the permanency of its installations, has a considerably easier planning and execution job than the other Services.

In its doctrine, the Air Force places early reliance on its Bare Base Mobility concept, to rapidly get minimum essential facilities into a theater of operation early in the deployment phase. Follow-on construction, during the buildup phase and beyond, is planned for execution by more conventional means, including support from Army engineer troops. As discussed previously, because of the notable lack of Army support during the RVN conflict, the Air Force has been able to set a precedent by forming "Red Horse" construction battalions, which doctrinally are to be used for performing area damage control type functions at airbases, but in reality are easily adaptable for new construction work. Whether the Air Force will be allowed to use "Red Horse" squadrons in future low-intensity conflicts is anyone's guess; however, it is this writer's opinion that this possibility is highly probable.

The Air Force recognizes, perhaps better than the other Services, that the preparation of a base development plan is essential to the orderly design and construction of its bases. It visualizes the development of the airbase utilizing an orderly and logical system of priorities. The Air Force sees construction of an airbase proceeding in accordance with priorities generally described below:

1. First Priority. Provision of the barest essential facilities needed for air operations at the earliest feasible time. This construction

will consist of the airfield operational facilities, such as runways, taxiways, approaches, and aircraft parking areas of minimum dimensions, plus minimum storage for bombs, ammunition, and aviation fuel. Also, essential sanitary and water facilities will be provided.

2. Second Priority. Increase the capacity, safety, and efficiency of all operations on the airbase. This consists of erecting indirect support operational facilities (aids to air navigation) and construction of access and service roads and essential operational, maintenance and supply buildings.

3. Third Priority. Improving operational facilities and providing for administration and special housing.

4. Fourth Priority. General housing is provided in this step.[31]

The Air Force uses various combinations of construction standards to control construction in the theater of operations, differentiating between standards for the airfield and standards for all other facilities. Regardless of priority or sequence of construction, those facilities other than the airfield may be built to any of three standards of construction. Each standard sets a limit on the quality and size of construction for the given facility. The three construction standards are defined as follows:

1. Field Type Construction (F). This is the lowest standard to be used in the TO. Operations may be hazardous and inefficient.

---

[31]U.S., Department of the Air Force, Planning and Design of Theater of Operation Air Bases, AFM 86-3, Washington, D.C.: U.S. Government Printing Office, January 20, 1967, p. 2-1.

Shelter consists of portable shelters without framing, flooring, screening or interior utilities.

2. Intermediate Type Construction (I). The facility provides reasonably efficient operation, but may be seriously jeopardized under adverse operating conditions. Shelter consists of portable shelters with flooring, framing, screening, and electricity.

3. Temporary Type Construction (T). This is the highest standard considered for the TO. The facilities are below peacetime standards, but provide reasonable safety and make operations practical under adverse operating conditions. Shelter consists of built in place wooden structures or prefabricated buildings of wood or metal. They are provided with electricity, a pressure water system, and waterborne sewerage where applicable.[32]

Airfields are constructed to one of two general standards which are essentially an indication of the anticipated life of the airfield. Expedient fields are for short term use and include unsurfaced assault airfields and expeditionary airfields surfaced with membrane or landing mat or both. Airfields intended for more extended use will generally be of semi-permanent construction and built to the full operational standard.[33]

An assault airfield will furnish a landing area for assault transports. This facility may be needed only a few days with only ten sorties or several months with up to 200 sorties a day. The surface

---

[32] Ibid., p. 2-2.

[33] Ibid., p. 2-1.

will usually consist of unprepared earth with only clearing and minimal leveling. Waterproofing and/or dust proofing may be needed to support sustained traffic during prolonged use.[34]

It is impractical to build airfield pavements to a low standard and then upgrade the standard later. Therefore, pavements should be built to the final quality immediately and developed by adding increments of pavement as needed. For this reason semi-permanent airfields have been designated according to the stage of development. Stage I would be a landing strip and minimum parking facilities and Stage II would be a runway and parallel taxiway with required aircraft parking. The landing strip in Stage I becomes the taxiway in Stage II.

The pavement should be the thickness necessary to meet the expected use and will normally be minimum operational or full operational on semi-permanent airfields or landing mat on expeditionary airfields.[35]

The Air Force recognizes that the construction combination to be followed in any single construction program is generally established by the theater commander. Naturally, the Air Force desires to construct an airbase to its ultimate design in a single step. In the majority of cases, where this cannot be done, the Air Force then strives to move from the initial combination directly to the ultimate combination in the second step. Various construction combinations are shown in Table 9. These are typical construction combinations which may be used to designate a type of construction when estimating what type of facilities can be

---

[34] *Ibid.*, pp. 2-1 and 2-2.

[35] *Ibid.*, p. 2-2.

TABLE 10

TYPICAL AIRBASE - SCHEDULE OF CONSTRUCTION

EXPEDITIONARY TYPE (For short term use)		Std of Const for Comb:		
FACILITY	PRIORITY	A (0-2 mo)	B (2-4 mo)	C (4-6 mo)
The Airfield	1	-	-	-
Sanitary Facilities	1	F	I	T
Direct Operational Support	1	F	F	T
Maintenance, Operations and Supply	2	F	F	I
Indirect Operational Support	2	F	F	I
Administration and Special Housing	3	F	F	I
General Housing	3	F	F	I

ASSAULT TYPE (Unsurfaced)		Std of Const for Assault Airfields	
FACILITY	PRIORITY	(1-2 days)	(2-30 days)
The Airfield	1	-	-
Sanitary Facilities	1	NONE	F
Direct Operational Support	1	NONE	F
Maintenance, Operations and Supply	2	NONE	F
Indirect Operational Support	2	NONE	F
Administration and Special Housing	3	NONE	F
General Housing	3	NONE	F

SEMI-PERMANENT TYPE (For sustained use)		Std of Const for Comb:					
FACILITY	PRIORITY	A	B	C	D	E	F
The Airfield	1	Stage 1		Stage 2			
The Sanitary Facilities	1	I	I	T	T	T	T
Direct Operational Support	1	F	I	I	T	T	T
Maintenance, Operations and Supply	2	F	I	I	T	T	T
Indirect Operational Support	2	F	F	I	I	T	T
Administration and Special Housing	3	F	F	I	I	T	T
General Housing	4	F	F	F	I	I	T

constructed with available resources. This Table may also be used to determine the order in which facilities should be upgraded. No particular airfield life is associated with the standards shown in Table 9, but they are arranged in order of permanence from A through F.[36]

AFM 86-3 contains planning criteria and definitive layouts for all facilities normally found at an airbase; also provided are engineering methods data, charts, and formulas for the design of those facilities which do not permit design prior to site selection. Guide rules are provided for site selection and layout of a base, for determining the number and type facilities needed, and for estimating materials and construction effort for each facility. Estimates of the weight and cubage of construction materials required is also given.

Construction drawings and bills of materials for standard facilities easily adaptable to repetitive construction are provided. Drawings and bills of materials are also furnished for facilities not adaptable to a standard building system. Typical designs furnished are for use in the Temperate Zone, but are adaptable, with slight modifications, to tropical construction. Although the buildings are not designed for arctic construction, the facility requirements and definitive building layouts can be used under those circumstances.[37]

Although this manual was republished in early 1967, the designs therein have not taken full advantage of the Air Force's recent Asian

---

[36]Ibid., p. 2-2.

[37]Ibid., p. 1-1.

experiences nor the current state-of-the-art concerning pre-engineered, prefabricated, relocatable structures. Also, no specific references to use of ADP by the Air Force in base development could be unearthed by the author.

SERVICE FUNCTIONAL COMPONENTS SYSTEMS

This section examines the Army Facilities Components System, the Navy's Advanced Base Functional Components System, and the Air Force's Bare Base Mobility Concept.

THE ARMY FACILITIES COMPONENTS SYSTEM (AFCS)

As previously mentioned, in SEA not a great deal of use was made of the Army's Engineer Functional Components System (EFCS). Principal criticisms of the Army system were that:

1. It did not contain enough designs and bills of materials for the combat zone, such as tactical bridging, field fortifications and protective structures.

2. It did not include tropical (or arctic) designs.

3. It used obsolete designs and bills of materials, particularly for airfields, communications and maintenance facilities.

4. The designs were too austere, and did not use modern materials. Also, the bills of materials were too large.

5. The Federal stock numbers listed were outdated and the cost data were not current.

6. No provisions were made for "off-the-shelf" prefabricated facilities.

7. The supply procedures were too complex at unit level.

8. Similar functions were not grouped together and the equipage lists were, like everything else, obsolete.[38]

As a direct consequence of lessons learned in Asia, the Army's Corps of Engineers is in the process of converting the obsolete EFCS into the Army Facilities Components System (AFCS).

The AFCS is integral to Army base development planning. The AFCS series of technical manuals provides a simple, logical means by which the construction materiel and effort needed for engineer support of a military operation can be determined. The planner must be familiar with these manuals because they provide a basis for base development planning.

1. TM 5-301, Staff Tables of the Engineer Functional Components System, is basically the planners manual explaining the concept and use of the system. It contains an abbreviated listing of all the equipages and facilities in the system and a detailed listing of the installations in the system. It also lists the cost, shipping volume, and shipping weights of materials. Further, the approximate construction effort in man-hours is computed for each facility and installation.

2. TM 5-302, Construction in the Theater of Operations, is designed for use primarily by engineer units engaged in the construction of Army facilities and installations. It contains construction site layouts, plans, and details for the facilities and installations, and tabulates bills of materials for these facilities and installations.

---

[38] Author's personal experience.

3. TM 5-303, Bills of Materials and Equipment of the Engineer Functional Components System, is intended for use by planners, construction units, and supply agencies. Construction data have been developed on the "building block" concept. The basic building block is a facility; others are installations and equipages. This manual contains descriptions of all facilities and equipages and a listing of all items in each facility and equipage. Each item in a facility or equipage is identified by a Federal stock number, abbreviated description, unit of issue, and the quantity required. The dollar cost, shipping weight, and volume for all materiel, together with the construction man-hours, are included in the description heading.

All data published in TM 5-301 and TM 5-303 are coded on magnetic tape for use in digital computers. This simplifies updating as changes occur in the building blocks. The use of ADP is also a means of providing current data to supply agencies and oversea commands when requested. Revised ADP systems to support base development planning are being developed by the Directorate of Military Engineering, Office, Chief of Engineers (OCE), Washington, D.C., and will be discussed later in the chapter.[39]

AR 415-16, Engineer Functional Components System, sets forth responsibilities for development and maintenance of the AFCS. AR 415-16 (DRAFT), Army Facilities Components System (AFCS) is currently being staffed at Department of the Army Headquarters and is scheduled to

---

[39] Base Development, FM 31-82, Op. Cit., pp. 6-3 and 6-4.

become effective on November 1, 1971. It describes the AFCS as: a military engineering construction support system for use in a theater of operations. It is composed of planning guidance, drawings, bills of materials, and listings in automated files describing pre-engineered facilities, buildings, other structures and works commonly required by land based military forces for base development, line of communication activities and tactical operations. The AFCS provides construction, logistic and planning data for:

1. Preparation, support and execution of base development plans.

2. Preparation and evaluation of operational projects for Class IV Materials.

3. Estimating materials, costs, manpower and transportation required for military engineering support of military operations.

4. Guidance to construction organizations as to site lay-outs, construction and erection details, bills of materials, construction effort and equipment.

5. Climatic options in facility designs suitable for use in temperate, tropical, desert, and arctic environments.

6. Options in construction standards suitable for phased development or improvement of operational facilities or for tailoring initial standards of construction to the availability of construction materials and effort.[40]

Designs and standards of construction in the AFCS are essentially intended for construction in wartime in overseas theaters of operation, but may be used on a selective basis for emergency and temporary peacetime construction in overseas areas or CONUS. The system emphasizes use of modular designs and structural components, and encompasses

---

[40]U.S., Department of the Army, Army Facilities Components System (AFCS), AR 415-16 (Draft), n.d., p. 2.

construction necessary to aid combat, combat support and combat service support functions. The AFCS includes designs and construction details for built-in-place facilities as well as alternative designs and erection details for pre-engineered, prefabricated, prepackaged, relocatable facilities. Publications pertaining to the system provide facility characteristics, construction drawings, listings of suitable materials, and related planning and logistical data.

The AFCS provides a catalogue of facilities which may be selected to satisfy the construction needs of a military function, organization, or activity in various environments and to satisfy the standard of construction specified by the joint or major Army commander. Construction, logistical and cost data in the system are catalogued to permit exploitation of ADP equipment in order to reduce time and effort required for planning and for requisitioning material.

The objectives of the AFCS are to:

1. Facilitate planning by major commands by providing standardized facilities.

2. Assure that facilities provided by the system are consistent with contemporary and future requirements of using organizations and also exploit technological advances in construction designs, materials and techniques affording advantages in total time, effort and funds.

3. Provide for complete logistic support of the system.

4. Standardize essential facilities, materiel, and construction procedures, and eliminate unnecessary facilities, materiel, and related data from the system.

5. Establish a common basis for, and achieve maximum use of the system in planning and erection of theater Army base development missions, including related training of individuals and organizations.[41]

---

[41] Ibid., pp. 3 and 4.

The Chief of Engineers has Army special staff responsibility for development and maintenance of the system to include:

1. Preparation and maintenance of engineering designs, standard drawings, bills of materials, and construction planning guides for the various facilities, structures, utilities, and engineering services required by the Army in support of military operations.

2. Preparation and revision of technical manuals, field manuals, and other technical publications pertinent to the system and dissemination of operational criteria and data for use in construction planning, construction material estimating, and construction guidance for military engineering support.

3. Coordination with Army staff agencies, major Army commands, and other Services as necessary to include: development of user requirements, concepts and priorities; adaption of new construction materials where applicable; establishment of military and performance characteristics and specifications; identification and classification of substitute items when required; and development of operational criteria and design data for Army constructed facilities, structures and engineering services which may be needed by the other Services. Based on this coordination, to publish new, or modify existing, AFCS publications to insure maximum continuing usefulness.

4. Exploiting the state-of-the-art and advances in engineering technology; preparing Qualitative Construction Requirements (QCR); conducting research, development and testing of improved designs and construction materials that are identified in QCR's for construction in the theater of operations.

5. Provision of technical advice and assistance in the use of AFCS including special purpose extracts, special computations, and current information on prospective revisions and/or additions to DA staff agencies, Combat Developments Command, Strategic Communications Command, Army Materiel Command, Continental Army Command, and other major Army commands. Provision of updated AFCS data banks to the Army Materiel Command.

6. Review and analysis of comments/recommendations on the system in the required annual reports of DA staff agencies, Combat Developments Command, Army Materiel Command, Continental Army Command, Strategic Communications Command,

other major Army commands, and implementation of approved changes. Preparation of Qualitative Construction Requirements (QCR) when research and development is necessary.

Other DA staff agencies are responsible for review and approval of standards, criteria and other qualitative aspects of facilities within their areas of staff cognizance.[42]

From the titles of TMs 5-301 and 5-303 it is evident that the reality of the AFCS is still a long way off, in so far as putting it into practice in a theater of operations is concerned. The TMs to support the system need to be completely revised and modernized; when this is done, the AFCS will have many advantages:

1. The time and effort needed to make materials lists will be reduced.

2. The materials costs available will be useful in programing and budgeting.

3. The system will contain manpower and equipment estimates.

4. It will be useful in computing stockage requirements to support operational projects.

5. The system will utilize ADP to accelerate requisitioning and to allow for quicker, more realistic planning decisions.

6. It can serve as a basis for training engineer troops on the types of construction needed in the theater of operations.

7. In the logistics area, the AFCS should reduce procurement time; aid in the standardization of construction materials; reduce wastage and in-theater stockage levels; and ease transportation planning by providing weight and cubage data.[43]

---

[42] Ibid., pp. 4 and 5.

[43] Author's personal knowledge.

The most serious potential disadvantage of the AFCS seems to be that, like the Navy's ABFCS, it might encourage lack of thought on the part of Army planners and use of AFCS as an all-inclusive "shopping" list without scrutiny to eliminate unnecessary items and add unincluded needs. Also, it does not constitute a complete package, as units, *per se*, are not included.

THE NAVY'S ADVANCED BASE FUNCTIONAL COMPONENTS SYSTEM

Construction of an advanced naval base is normally accomplished through use of a system employing modular building packages — the Navy Advanced Base Functional Component System (ABFCS). These packages of men and materiel can be readily altered or tailored to fit frequently changing military support requirements. Each functional component is a grouping of personnel, equipment assemblies, and essential structures designed to perform one of the specific tasks required by the mission statement of the advanced base. Essentially, the functional components are tools employed in planning for base development, stockpiling needed equipment, training base operating personnel, and constructing the base. In addition to people and equipment, a component includes, as pertinent, workshop housing, vehicles, boats, shop and office equipment, and a 30- to 90-day initial supply of consumables. The components are given names to indicate their function and unclassified code numbers consisting of a letter and number combination to provide easy reference.[44]

All functional components currently in planning use are briefly described in OPNAV Instruction 4040.22C, *Table of Advanced Base*

---

[44] *Base Development*, NWIP11-23(A), *Op. Cit.*, pp. 4-4 and 4-6.

Functional Components, and NAVSUP Instruction 404.31, Catalog of Advanced Initial Outfitting Lists (Abridged). These publications describe the capability of each of the components in general terms, list required numbers of officers and enlisted men, and note the types of material and equipment items included in the component, together with the summarized tonnages and shipping space needed. The system encompasses more than 300 functional components, covering all significant tasks normally performed at advanced bases organized into the following major groupings according to the function they are planned to provide:

A - Administrative	G - Medical and Dental
B - Harbor Control and Defense	H - Aviation
C - Communication	J - Ordnance
D - Supply	N - Camp and Welfare
E - Ship and Boat Repair	P - Construction and Public Works
F - Cargo Handling	S - Special Group

This system is unique in that the Navy construction troop units are a part of the functional component system. For example, a mobile construction battalion (MCB) is a P25 functional component. A construction battalion maintenance unit (CBMU) is a P5 functional component.[45]

The ABFCS provides a means of planning by the selection of functional building blocks and tailoring the overall organization to perform the tasks to be done at the advanced base. In practice, broad base development planning is expressed in terms of complete functional components, as listed in OPNAVINST 4040.22C. When planning is done in more detail and in order to requisition materials, the Advanced Base Initial Outfitting Lists are required.

---

[45]Ibid., p. 4-6.

Specific functional components are tailored by the reduction, omission or the addition of quantities of specific items to the standard outfitting lists. Also, those components which include covered working space, living quarters and so forth may be designated as tents or huts, and further refined as tropical, northern or arctic. This furnishes a way of providing components compatible with tables of organization (TO) standards and climatic conditions.

Selection of a given component, appropriately designed, provides the number of square feet per man and the desired permanency of construction, in compliance with Navy standards. Once the total package has been selected, the following information can be rapidly derived:

1. The buildings and structures needed.

2. Materials and equipment for utilities.

3. All equipment and materiel needed to outfit the base.

4. Initial stockage of supplies.

5. Military personnel needed to operate the base, by rank and rating.

6. Approximate land area required for facilities. Data available include the land needed for each component. This serves as a starting point for site planning and obviates the initial need for detailed site plans.

7. A basis for estimating the construction effort needed.[46]

The major advantages of the ABFCS seem to be that it provides:

1. A proven system which simplifies and promotes accurate estimates of personnel and materiel requirements. It is an

---

[46] Base Development, FM 31-82 (Test), Op. Cit., pp. 6-7 and 6-8.

excellent yardstick for procurement and aids in assembly of material. Complete sets of drawings and typical layouts are provided with each component.

2. An aid for establishing controls on the amount of supplies in the area of operation, in the pipeline and in CONUS.

3. Measurement units for use in preparing forecasts of availability, deficiencies, and surpluses at all levels of command.

4. A way of measuring man-days of construction effort, land area requirements, shipping tonnages, and construction costs. Instructions are also provided for use in assembling and erecting structures, which significantly reduce trained engineer requirements in the field.

5. A check list for the proper scheduling of requirements.

6. Bases that can be tailored to suit needs.

7. A useful, convenient planning tool for emergency restoration of damaged facilities.

The most serious disadvantage of the ABFCS is that it encourages use as an all-inclusive list without the elimination of unneeded items, and the addition of overlooked requirements. Planners must remember that the system is only a tool, and its use must be adopted based on careful analysis.

Another difficulty with the system is that it was designed in World War II, and has not yet been redesigned to take full advantage of modern technology to reduce construction effort and improve retrievability and re-use.[47]

Lastly, during a MILCON type funding environment as found in RVN, it is difficult to break down the contents of each component so

---

[47] Base Development, NWIP 11-23, Op. Cit., pp. 4-8 and 4-9.

that materials can be identified and costed to the proper account, such as Military Construction, Navy (MCN) or Operations and Maintenance, Navy (O&MN).[48]

In addition to the documents already mentioned, the ABFCS is supported by Volumes 1 and 2 of Department of the Navy publication NAVDOCKS P-140. Similar to the Army's TM 5-302, NAVDOCKS P-140 provides drawings prepared in a schematic manner to provide field personnel with information to lay out basic structures and equipment. Unfortunately, though revised in January 1966, it is already obsolete because it is filled with antiquated designs such as numerous variations of the World War II quonset hut.

Yet another potentially valuable document for the base development planner is NAVPAC P-80, January 1967. Although primarily geared toward permanent construction, it contains much valuable information on planning factors, standards, and guides to compute quantative facility requirements. Essentially, it deals with the basic philosophy of planning factors, their authority, and use. The manual has a compilation of planning factors, planning data, and related space criteria. The material is arranged numerically by category groups, basic categories and Navy codes.[49]

Ancillary to the ABFCS is the Short Airfield for Tactical Support (SATS), which is presently in the U.S. Marine Corps inventory and

---

[48]Author's experience.

[49]U.S., Department of the Navy, Facility Planning Factors for Naval Shore Activities, Facilities Engineering Command, Washington, D.C., NAVFAC P-80, January 1967.

available to deploying units. It is a prime example of the modular concept in base development. SATS provides a variable length aluminum runway; portable aircraft arresting gear and catapulting equipment; traffic control facilities, navigational aids, approach control equipment, and tactical airfield lighting; a fuel dispensing system; prefabricated hangers; and a variety of vans for maintenance shops, briefing rooms, meteorological service, medical support, and a liquid oxygen/nitrogen generation plant. The system also comes with specially designed ground support vehicles. All the components of the SATS blend together to make it essentially equivalent to a land based aircraft carrier. All components are air transportable.[50]

Major William P. Haight, U.S.M.C., states:

> SATS is a giant step forward in Marine Corps requirements for a highly mobile, economical, and reusable runway which can become operational within the first seventy-two hours of amphibious assault operations.[51]

Although the SATS operational facilities appear first rate, the primary disadvantage of the system is that supporting facilities, such as quarters, messing and sanitary facilities for the base personnel, are still provided by the conventional methods of tentage or huts. No effort has been made to standardize and prefabricate structures to the extent of the Air Force's Bare Base Mobility concept.

---

[50] Richard D. Revie (Maj., U.S.M.C.), Modular Construction Concept for Marine Corps Advanced Base Development in Counter-insurgency Operations, Thesis, Air University, Maxwell Air Force Base, June 1967.

[51] William P. Haight (Maj., U.S.M.C.), U.S. Naval Institute Proceedings, "Instant Airfields Ashore", November 1968, p. 168.

THE AIR FORCE'S BARE BASE MOBILITY CONCEPT

The Air Force's latest experiences in SEA proved that its existing system could not fully support fast employment of tactical forces, nor was it adequate for extended deployments. Many manhours were spent maintaining flimsy shelters for men and materiel. In the end, many dollars were spent erecting more permanent structures to provide sustained support of tactical airpower. A completely new line of mobility equipment had to be designed. In 1965, the Air Force Chief of Staff expressed concern that mobility equipment and facilities had not progressed to meet the need. By 1966, Tactical Air Command outlined a Bare Base Support Program, stating requirements for facilities and equipment and desired performance capabilities.

After much study, the Aeronautical Systems Division, Air Force Systems Command, was authorized to manage the development and procurement of an entirely new line of mobility equipment. Most important, the new concept had to interface with newly developing weapons systems, such as materials handling equipment (463L), the F-111, the F-4, and specialized inter-service hardware.

Effectiveness estimates of the newly developed bare base system indicate that a Tactical Air Wing can be completely air transported with all facilities, without need for later permanent construction, at a savings of 40 percent in tonnage, 50 percent in time, and 50 percent less manpower than any current mobility technique.

This totally new concept provides all structures for billeting, shops, hangers and storage. Most of the modular designed structures

also serve as the shipping container for equipment to be used in the building after it is erected or expanded at the deployment site. A key feature is that the same personnel who will use the building can expand and erect it for prompt use, or package it for redeployment. When not in use, all structures and equipment can be maintained by units at their home bases.[52]

As an example of the ease of erectibility of the entire system, the personnel shelter, one of the principle components of the system, can be transformed by <u>four</u> men in less than <u>one</u> hour into:

- a barracks for up to 24 men (double decked)
- a station for aircrew alert
- an administrative office
- an aid station or dispensary[53]

The concept also provides all required support systems - generators and distribution systems for electrical power; runway lighting and maintenance equipment; a fresh water processing and reclamation system; oxygen generator units; refueling, firefighting, utility and cargo vehicles; dining facilities, a hospital complex and latrines; a complete laundry facility; and all required heating and air conditioning systems. Also included in the concept package is a bomb damage repair system, crash removal equipment, and an air transportable runway construction equipment system. One of the real beauties of this bare

---

[52]U.S., Department of the Air Force, "Project 3782. Bare Base Mobility", Brochure, Aeronautical Systems Division (AFSC): Wright-Patterson Air Force Base, pp. 6-7, January 10, 1971.

[53]Goodyear Aerospace Corporation, "Modular and Expandable Shelters for Global Mobility", Brochure, Goodyear Aerospace Corporation: Akron, Ohio, pp. 8-9, January 10, 1971.

base system is that it is entirely transported in C-130 aircraft, and once installed, it can be totally resupplied by the same aircraft.

When no longer required, all systems and structures can be quickly converted to their shipping configuration and transported back to home station to be ready for additional contingencies.

Bare base equipment is designed for climatic conditions of from -25° to $+125^{\circ}$F, with a minimum life of five years when deployed twice a year, or a minimum storage life of ten years. The system is designed so that a tactical unit can be operational in a matter of hours after the first plane load of equipment lands at the selected base site.

The effectiveness of this new concept cannot be compared with any other system because, to the author's knowledge, there has been no other system to approach this capability. However, cost comparisons can be made.

Comparing a wing-sized bare base deployment to past contingency deployments, including SEA, provides a definite contrast in cost/effectiveness. The cost of a wing-sized set of bare base facilities is currently about $19 million. Permanent type construction to accomplish the same functions, with the same cubage, would cost between 19 and 58 million dollars, depending on the overseas location. An example is Tuy Hoa Airbase, constructed several years ago in South Vietnam under a "turnkey" contract. This base cost $43 million, plus taxiways and runways. Due to inflation, present construction costs, less runways/taxiways, are estimated at approximately $65 million.

Another consideration, in present day practice fixed base structures are normally not designed according to the minimal planning factors used in the "bare base" concept, thus those facilities built in more normal fashion are usually much larger, which could double the cost figures previously sited.

Thus, it is feasible that the bare base concept could provide up to a dozen contingency deployments for about the same expenditure as one minimum cost, permanent type base. Also, older methods cannot come close to providing operational capability within the same time frame as the Bare Base Mobility Concept.

Other advantages bare base equipment offers over permanent construction concerns the national economy and international relationships. Past experience has shown that crash construction programs overseas stimulates inflation in the local economies, and facilitates graft and corruption in the local governments. Then, when forces are rolled-up, difficulties often arise over disposition of constructed facilities and equipment assets in-place. All of this has a detrimental effect on the balance of payments. Bare base equipment not only is purchased within our economy, but at the end of hostilities it can be returned, all in a matter of days, and reused without appreciable loss.[54]

The major disadvantages of a bare base concept is that it does not integrate prefabricated matting into the system as in the SATS concept, nor does it utilize resinous membranes in the system. Primary reliance is placed on having at least minimal runways/taxiways already available at the proposed base site.

---

[54]"Project 3782. Bare Base Mobility", Op. Cit., pp. 7-9.

AUTOMATIC DATA PROCESSING SYSTEMS (ADPS) ADAPTABLE TO BASE DEVELOPMENT PLANNING AND EXECUTION

As have planners and managers in all walks of life, leaders in DOD/JCS and the Military Departments have recognized that there are a wide range of ADP applications which have not as yet been implemented or fully exploited. As a result of our SEA experiences, it has become evident to even the most casual observer of the construction programs there, that they were readily adaptable to ADP applications. Consequently, planners in DOD/JCS and several of the Services have gone to work on developing ADP systems primarily designed to assist in base development planning and execution (BDP&E). Other ancillary systems which have the potential of providing support to BDP&E have also been developed. Some of these ADP systems will be discussed briefly in this chapter.

PROGRAM FOR ESTIMATING CONSTRUCTION REQUIREMENTS (PRESCORE)

The PRESCORE system is a planner's tool for evaluating the construction requirements of a theater of operations at various levels of detail. The military unit is the basic element of computation in the PRESCORE system; it either directly or indirectly generates a gross construction requirement (refer to figure 8). The military planner may directly generate a requirement by optionally specifying a specific installation when deploying a military unit. For example, a medical unit might require a hospital to effectively perform its mission. This is one means that buildings (vertical construction) may be generated. The second way is indirect generation which is brought about by examining

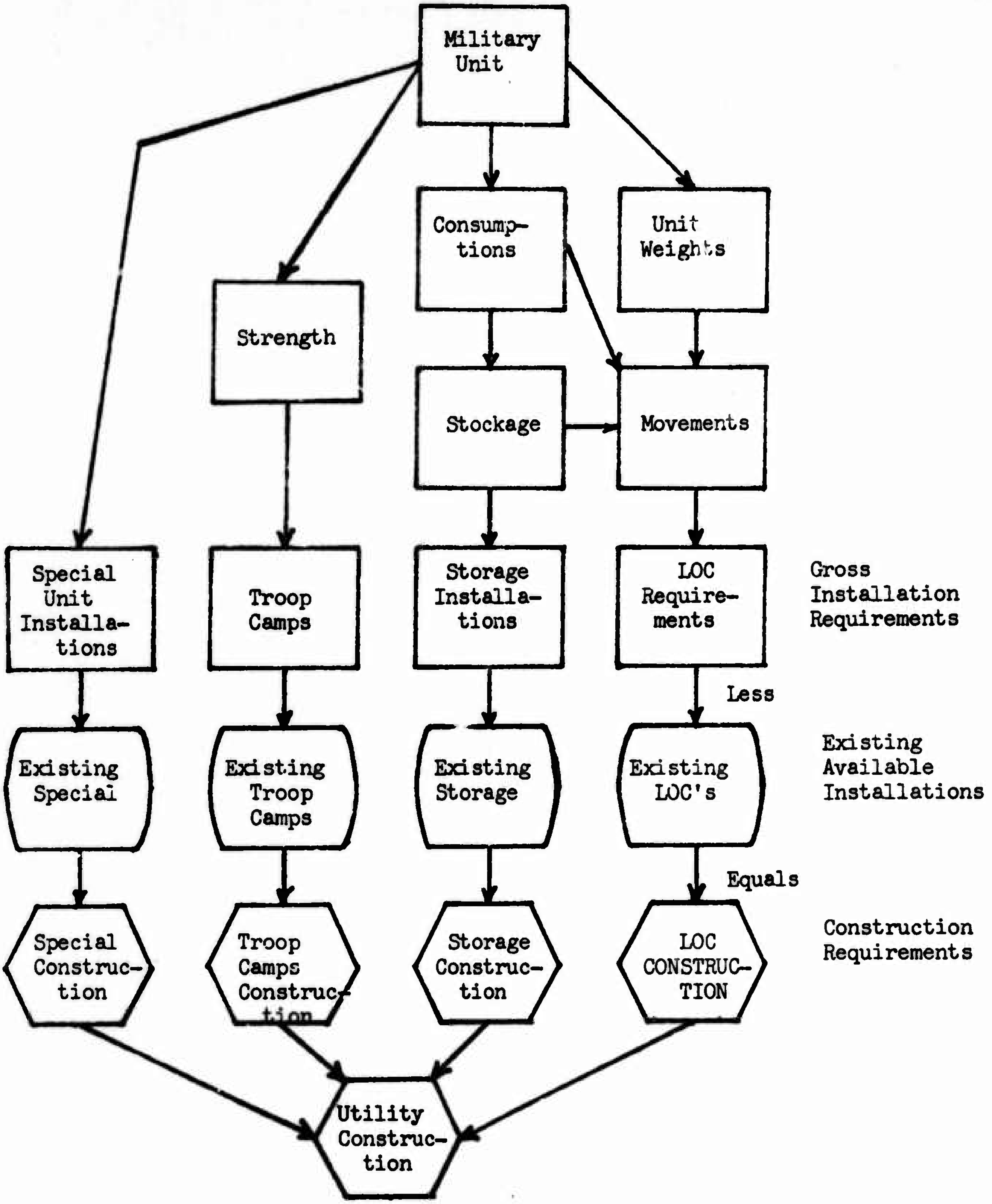


FIGURE 8

CONSTRUCTION REQUIREMENT DETERMINATION

Source: Research Analysis Corporation, "PRESCORE Program for Estimating Construction Requirements", Manuscript: McLean, Virginia, April 1968.

all units deployed in a region together. These clusters of units will require supporting installations such as troop cantonments and storage depots. This requirement is generated by aggregating troop deployments to form populations and unit consumptions which are the tons of materiel required to support the troops.

There are four consumption categories defined in the PRESCORE system: dry cargo; refrigerated cargo; bulk petroleum, oil, and lubricants (POL); and ammunition. These are stated for the whole unit; and together with the unit's gross and net weights, they form the bases for the total LOC movements which will take place to move these supplies from the Communications Zone Rear (COMMZ Rear) forward. The movements take place in accordance with supporting-supported relationships and stockage policies which the analyst specifies. The stockage policies state the percentage of cargo which is to be covered and the days of supply which each of the mission functions will stock for the division area. Based upon these relationships, supply movement takes place from supporting region to supported region; any deficiencies which result will effect horizontal construction. This is a requirement for land road improvement, railroad rehabilitation, or pipeline enlargement (or new construction). Two other LOC's are considered, inland waterways and air movements but they do not result in any construction requirement. They serve the purpose of redistributing the workload as described by the analyst in his input. For example, assume that all policies have been properly defined to the PRESCORE system; that deployments and troop descriptions have been entered into the scenario; and that supporting-supported relationships have been developed and defined to the system.

Also assume that a consumption tonnage has been generated at point A which is supported by point B. Finally, assume that this requirement to be moved is 80,000 tons and that inland waterways move 25,000 tons, air movements account for 25,000 tons, and railroads move 5,000 tons. Using these figures and following the computational work pattern employed by the PRESCORE system we observe the following land road LOC requirement to be:

Requirement		80,000
POL (by pipeline)	0	
Waterways	25,000	
Railroads	5,000	
Air Movement	25,000	
Total Moved		55,000
Land Road Requirement		25,000

This 25,000 ton requirement would become the basis for evaluation as to adequacy of the capacity of the road. Thus, if the current capacity were 15,000 tons, the system would record a deficit of 10,000 tons; and an attempt would be made to effect construction which would improve the road so that it would be capable of handling this construction deficit. This is the classical theater of operations which depends on land road movement as the basic link between each of the five mission functions: COMMZ Rear, COMMZ Forward, Army Rear, Corps Area, and Division Area.

Once a gross construction requirement has been generated, the model next attempts to produce a net construction requirement by subtracting existing resources from the gross requirements. For example, assume there is a requirement for six 500-bed hospitals. Further assume that the analyst has entered (perhaps after studying an intelligence

report on the region) two 500-bed hospitals as being in the region at the time of the analysis; this would leave a net deficiency of four 500-bed hospitals, which is the net construction requirement.

The planner may specify levels of construction to represent the degree of permanency desired. There are six levels currently being used by the Army; these were discussed earlier. The planner may use one policy, a set of five (5) levels (one for each mission assignment), for all installations, or he may optionally specify different policies for specific installations.

Even though the PRESCORE system is designed for the analysis of a classical theater of operations, with planner interpretation of the theater, other applications may be studied (e.g., unconventional warfare). Postulated deployments can be made to an area such as RVN, once certain data refinements have been made. One refinement would be the addition of air movements data to realistically mitigate the road LOC burden. Railroad movements should also be considered. A hospital routine has been written to compute hospital requirements based upon computational procedures defined in FM 101-10-1; this eliminates the military analyst from assigning hospitals as an interpretation based upon planner "intuition". Data for PRESCORE is currently programed in the National Military Command System Support Center (NMCSSC) Information Processing System (NIPS); the PRESCORE Intelligence File, PRINA; or the Technical Factors File, COFCA.[55]

---

[55] Research Analysis Corporation, "PRESCORE Program for Estimating Construction Requirements", Manuscript, McLean, Virginia, April 1968.

SIMULATION AND GAMING METHODS FOR ANALYSIS OF LOGISTICS (SIGMALOG): THEATER CONSTRUCTION MODEL

SIGMALOG is a largely computerized system of models that makes possible the rapid determination of logistics resources needed to support military operations and the Army's capability to provide them. The system was necessitated because of the Army Staff's need to compute logistic support needs for many alternative plans involving forces of varying size and composition in different environments and types of operations. A typical large scale logistics study has involved up to 18 separate staff offices for periods of from 4 to 6 months. The need to determine logistics requirements and the Army's capability to provide them for an increasing number and variety of contingencies made it imperative that such planning be automated to the greatest extent feasible. The development of SIGMALOG is completed. It has been accepted by the Army and is being applied in-house.

SIGMALOG is a two part system consisting of SIGMALOG I and SIGMALOG II. SIGMALOG I computes time-phased logistic requirements generated by a contingency plan or study, such as: troop movements, casualty evacuation and hospitalization, construction, combat service support units, personnel replacements, materials resupply, intratheater transportation, intertheater movement of troop units, replacements, and materiel. SIGMALOG II matches needs with available resources to determine possible shortfalls in the Army's capability to support selected contingency plans or studies. It shows, for up to three plans simultaneously, time-phased shortfalls: combat service support units, major items of equipment, ammunition items, and intertheater transportation.

The SIGMALOG I System consists of four data base programs and nine largely computerized models. The relations and the automated flow of information among them are shown in the accompanying sketch (Figure 9).

The Data Base Programs retrieve from Army data bank files information regarding unit personnel and equipment authorizations and equipment weights and copy them on tapes for processing by the models of the system.

The Force Employment Model produces data that reveal the arrival of troop units in the theater and their movements to employment locations, the activity of the units after arrival on location, the number of personnel assigned to these units and other personnel in the theater associated with the military operation.

The Medical Model computes the number of personnel casualties the units sustain and the requirement for their hospitalization or evacuation.

The Replacements Model computes the number of personnel required to replace losses from battle and nonbattle causes, evacuation, and rotation.

The Resupply Models - there are three - compute the consumption, loss, or expenditure of supplies by class of supply, major end item, and ammunition item; theater stocks; and resupply movements necessary to maintain theater stock levels.

The Transportation Model assesses the capability of the transportation system (rail, road, ports, etc.) in the area of operations to discharge and support the movement of troop units and materiel and computes the requirements for the units and carriers needed to effect the movements.

The Construction Model determines the requirements for facilities to support the force and computes the construction units and materials needed to construct new facilities and maintain those already available.

The Maintenance Model computes aggregate maintenance workloads for the equipment of units in the operation.[56]

---

[56] Research Analysis Corporation, "SIGMALOG", Pamphlet: McLean, Virginia, n.d., pp. 1-5.

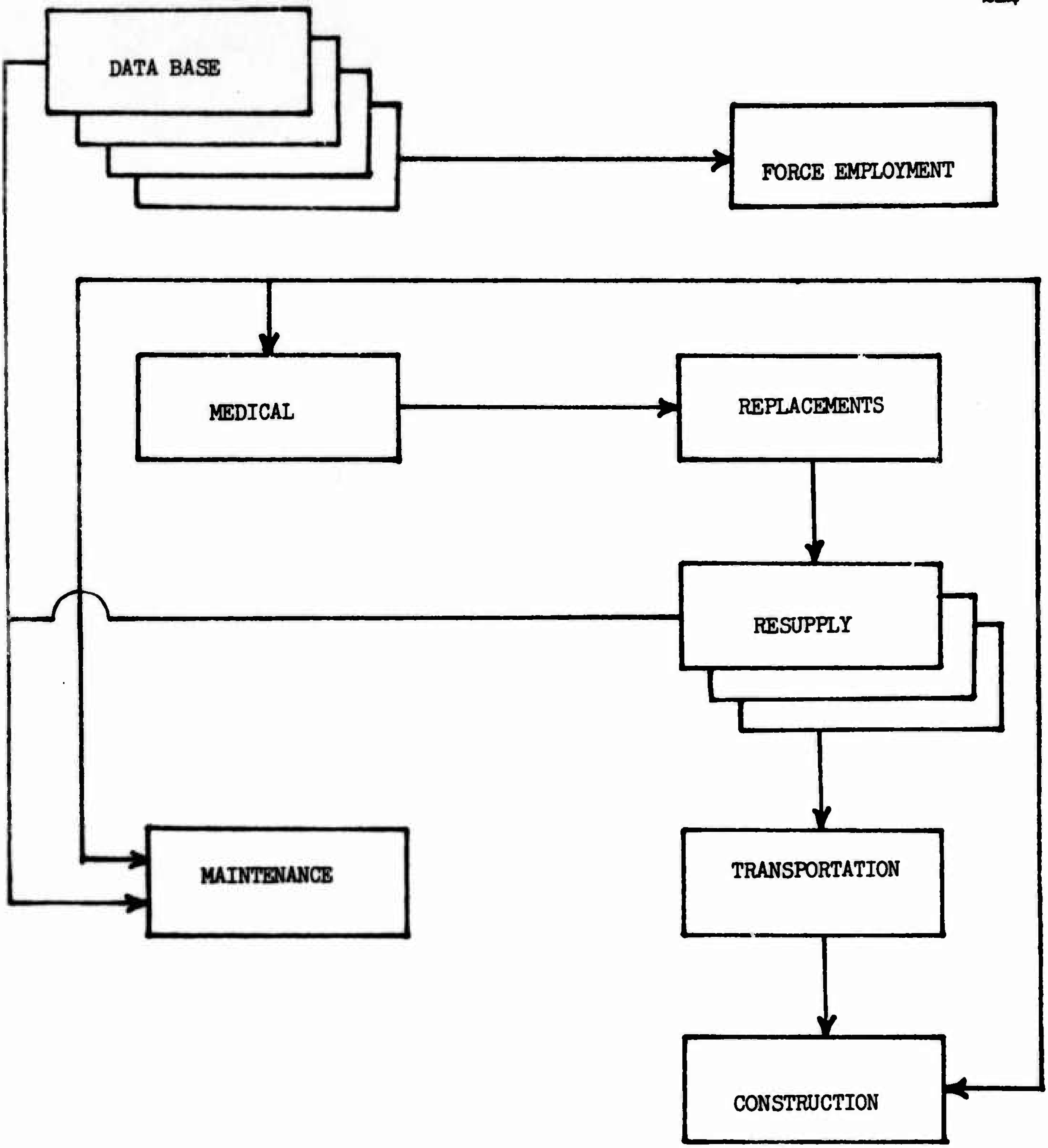


FIGURE 9

GENERAL RELATION OF SIGMALOG MODELS TO EACH OTHER

Source: Research Analysis Corporation, "SIGMALOG", Pamphlet: McLean, Virginia, n.d.

To aid the analysis of time-phased significant logistic events in discrete areas of the theater, the use of SIGMALOG requires the definition of several basic parameters. The geographic area in which the military operation is postulated must be described in sufficient detail to permit identification of significant tactical and logistical operations at key points. This is facilitated by dividing it into subareas, or regions, in which these key points are located. The time span of the military operation to be simulated must be divided into segments, or time periods, that will permit the postulation of tactical operations and the examination of logistic operations. The forces engaged in the operation must be structured to permit identification of those with unique support characteristics that affect logistical operations. Additional parameters are defined for materiel, casualties, and maintenance.

In addition to printed reports that record the simulation results of each model, SIGMALOG I produces a tape file for input to SIGMALOG II that contains time-phased requirements for combat service support troop units, replacements, and resupply materiel.

SIGMALOG II consists of four separate modules that compare time-phased requirements for up to three plans with available resources to identify shortfalls.

The first module accepts inputs of combat service support (CSS) troop unit requirements from SIGMALOG I and the time-phased availability of comparable troop units from the Army's Force Accounting System data bank and compares them to determine whether there are shortfalls.

The third module similarly matches SIGMALOG I-generated requirements for selected items of ammunition with resources to determine the adequacy of existing stocks.

The fourth module, given a constrained fleet of aircraft and ships, will determine how well they meet intertheater movement requirements to support the plan or plans, or, given a fleet of eligible aircraft and ships, will determine the optimum mix and minimum numbers of each required to support plans(See Figure 10).

Over time SIGMALOG I could be used to compute the requirements for many contingency plans. These can be stored on magnetic tape files in a library readily available for further analysis when required.

At a point in time when the Army wants to assess its capability to support several plans concurrently, the files for these plans are taken from the SIGMALOG I file library. Simultaneously, tape files of available resources are extracted from Army resource data banks, and intertheater transportation data are prepared. The SIGMALOG I files and the resource files are interfaced with SIGMALOG II, where the phasing of the plans on a base point in time, adjustments of time between requirements and resource availability, the allocation of resources to meet requirements, and their comparison module-by-module are executed. The reports, one by each module, show shortfalls, if any, for each plan.

SIGMALOG I is a fully tested system. Army personnel have been trained in its use, and the system has been turned over to the Army for in-house use.

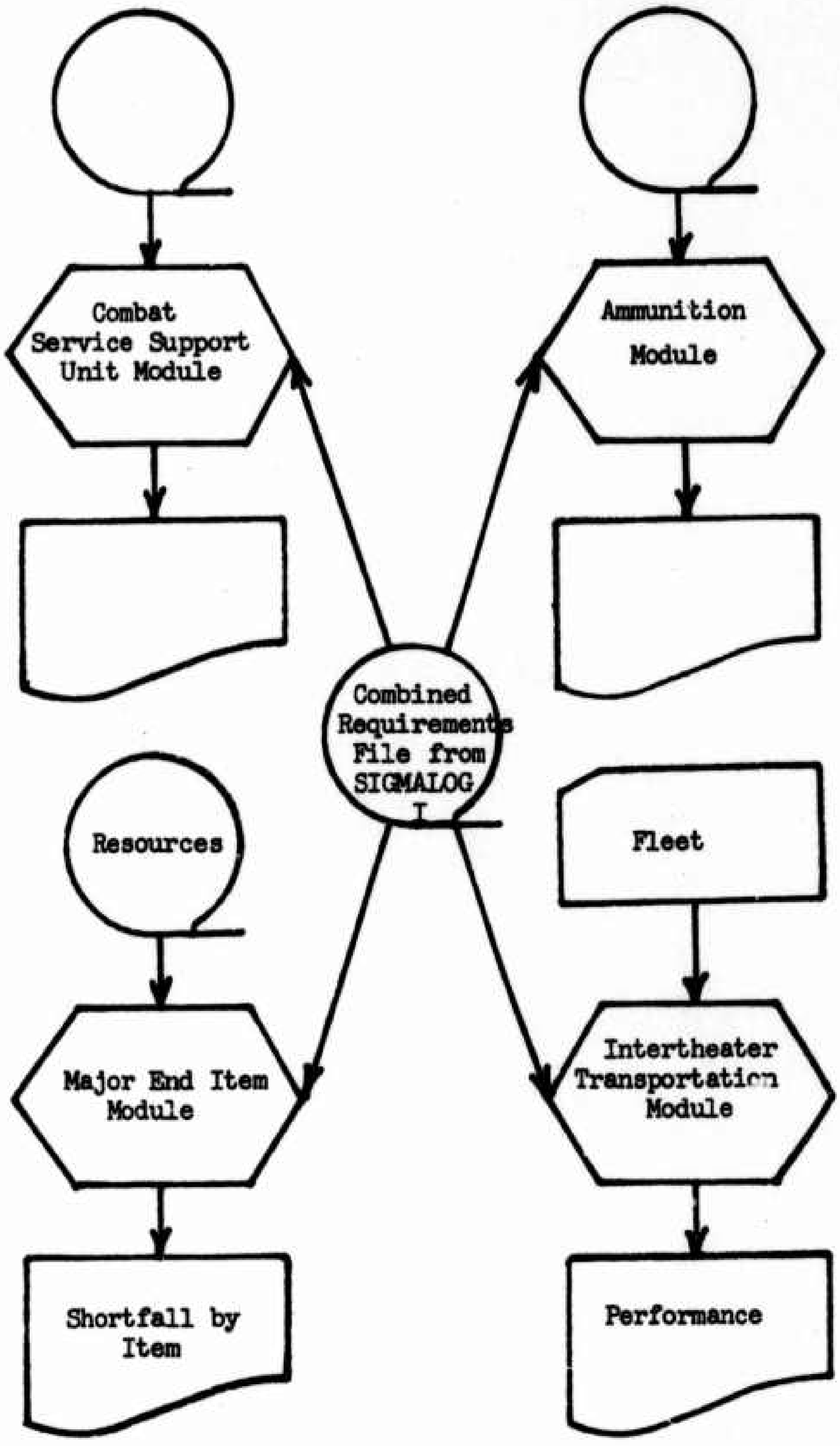


FIGURE 10

RELATIONSHIP OF THE MAJOR COMPONENTS OF THE SIGMALOG II SYSTEM

Source: "SIGMALOG", Ibid.

It has provided the Army the ability to standardize logistic planning worldwide and to make planning more timely, less expensive, and more reliable. It can be applied independently to the range of uses previously described.[57]

The Theater Construction Model was specifically developed to automate the computations of the engineer construction requirements (effort and material) to support a theater of operations. The calculations consider four categories of construction performed: construction of new facilities, conversion of previously constructed facilities, maintenance of LOC facilities, and repairs of facilities damaged by enemy action. Facilities needs are computed as a function of the units in the theater, theater strength, materiel stockage, utilities requirements, and LOC activity. Also, the model reflects the variable degrees of refinement and services (standards) to which facilities may be provided using the AFCS. A secondary consideration in the model development was to reduce the large amounts of manual effort required to prepare the imput data for the simulation while at the same time maintaining a flexible model. Thus the model must accept general and specific imputs concerning various policies, such as construction standards.

The imputs to the model are used to compute the facility requirements, and, in turn, the engineer construction unit and material requirements. These are calculated without regard to constraints concerning available construction effort or material and without any attempt to optimize engineer construction or theater considerations. The major inputs and outputs of the model are shown in Figure 11.

---

[57]*Ibid.*, pp. 6-11.

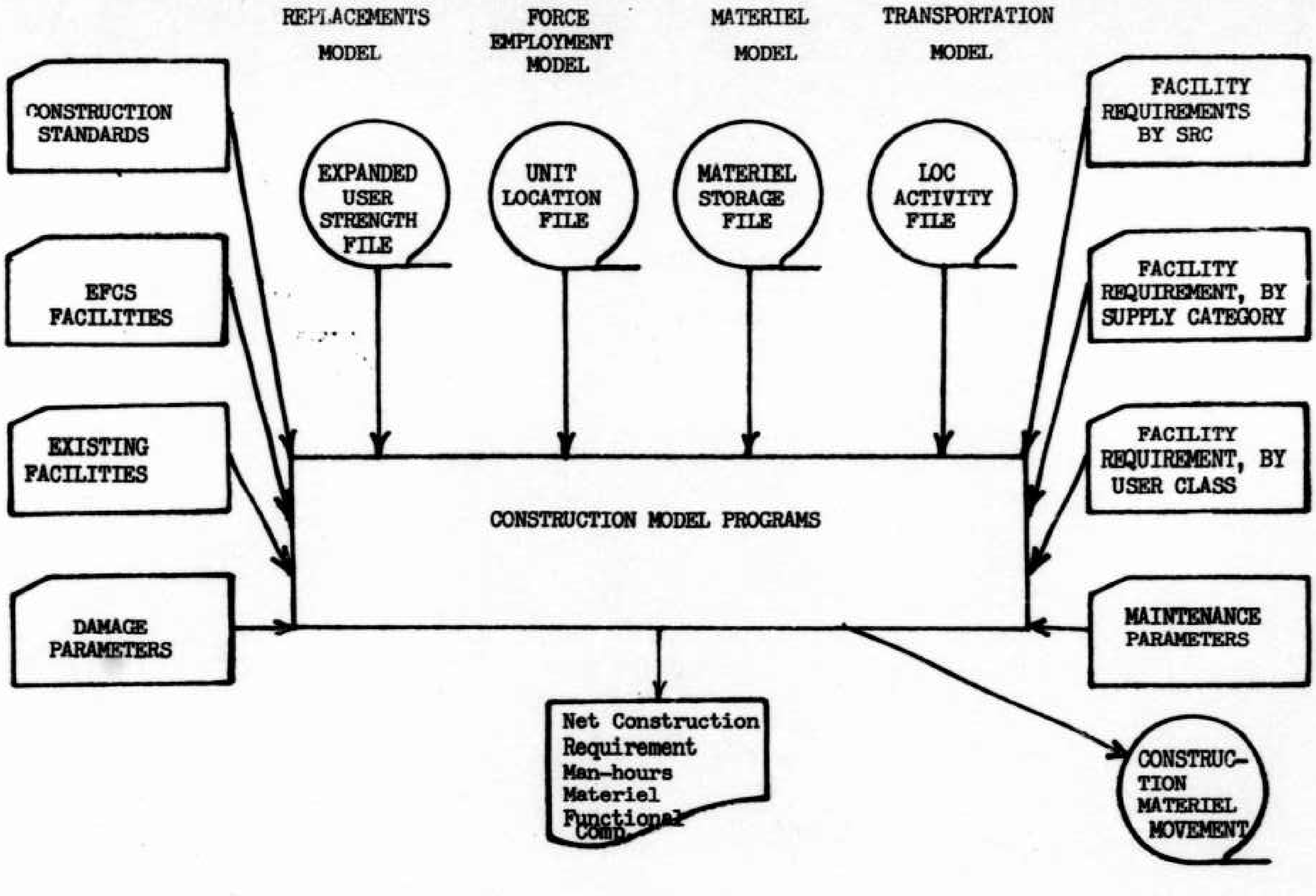


FIGURE 11

SIGMALOG I: THEATER CONSTRUCTION MODEL

Source: Research Analysis Corporation, "Simulation and Gaining Methods for Analysis of Logistics (SIGMALOG): Theater Construction Model", RAC-TP-389, Technical Paper: McLean, Virginia, May 1970.

The model computes the gross theater facility requirements, reduces these requirements by the existing facilities that can be used, and reports net or new construction requirements. These net requirements are reported according to the code system of the AFCS. War damage repair and the LOC maintenance effort are calculated as a function of the existing facilities used, plus the newly constructed facilities. The man-hours of work (in three categories: horizontal, vertical, and indigenous) and construction materiel are calculated by region and time period. The number of required engineer construction units is computed as a function of the man-hours of work.

The outputs of the model consist of one magnetic tape file and various printed reports. The tape file is the Construction Materiel Movements File, which can be used by the Transportation Model on a recycle of the system or a rerun of the Transportation Model. The reports fall into six general sets: Basic - entire theater construction man-hour and material requirements summed by time period or region; Time - Period Region - man-hour and materiel requirements by time period and region; Detail - man-hour and materiel requirements by facility and task; Materiel Movements; Construction Engineer Unit Requirements; and Inputs - a listing of the player input data.

The computer program of the Theater Construction Model is written in the FORTRAN IV language for the Control Data Corporation 6400 computer. There are four separate FORTRAN programs and three system sorts.[58]

---

[58]Research Analysis Corporation, "Simulation and Gaming Methods for Analysis of Logistics (SIGMALOG): Theater Construction Model", Technical Paper, RAC-TP-389, McLean, Virginia, May 1970, pp. 2-11.

The Construction Model is currently being refined even further by the Engineer Strategic Studies Group (ESSG) to develop a supplementary system known as the CASTLE model, which will develop specific projects, balance capabilities and requirements, and schedule construction. It will also generate reports required by the Theater Commander and JCS/DOD as needed.[59]

THE NAVY'S STINGER (SEABEE TACTICALLY INSTALLED NAVY GENERATED ENGINEER RESOURCES)

The STINGER system is an ADP system developed by the Naval Facilities Engineering Command (NAVFACENGCOM) approximately two years ago, which uses the systems approach to solve problems associated with naval combat zone construction planning and execution. It runs the full range of problems, from expression of combat construction requirements to the work actually accomplished in a theater of operations. STINGER is an integrated system, developed using Operations Research/Systems Analysis (ORSA) techniques, that assists in solving problems of: force requirements; personnel and unit readiness; unit home porting and rotation; ABFC requirements, adequacy and availability; construction needs; and other problems associated with combat zone construction, such as training of personnel and shipping of materiel. Using the ORSA approach, the best solution is unknown, but many solutions are developed and compared, using various trade-offs, until an extremely efficient yet effective system is found.

---

[59]Review of working papers obtained from ESSG by LTC John Hatch, U.S. Army Command and General Staff College, during April 1971.

The STINGER system has various sub-programs that can determine the construction needed for support of specified combat forces, as well as the construction force, equipment and materials needed to place this construction at a specified location, within a given time frame. Further, the sub-programs permit derivation of work in place (WIP) that can be accomplished by a given force, at the least cost, described by numbers of functional components, tactical support components, and other time-phased construction requirements. Several key sub-programs are:

1. Combat construction execution required by a Marine Expeditionary Force (MEF) for one year.

2. Naval Construction Force sub-program, which contains manpower and equipment routines.

3. The Homeporting sub-program, which contains Mobile Construction Battalion (MCB) equipment overhaul, MCB equipment spare parts, and MCB equipment number routines.

The most important uses of the STINGER system appear to be:

1. Determination of construction requirements.

2. Translation of requirements into the construction force assets needed to fulfil the requirements.

3. Provision of a ready analysis of the best approach to resolve specified construction needs, such as determination of the advantages/disadvantages of rotating or relocating MCBs, and the amounts of ABFCS stocks to be maintained due to procurement lead times.

4. Determination of what happens when certain completion dates are advanced.

5. Automatic provision of weights and cubes for materiel.

6. Consideration of numerous alternatives, using trade-offs of time, money, manpower and equipment.

7. Rapid identification of very sensitive elements of the system, which also highlights areas for potential research and development.

8. Provision of supportable input for Navy planning, programing and budgeting.

Since the model can be used with any naval contingency scenario to formulate facilities requirements and to develop the manual construction force system needed to accomplish that construction, it seems adaptable to calculating all construction required for a contingency, and, like PRESCORE and SIGMALOG, is potentially useful as a joint tool.[60]

NEW CONSTRUCTION MODULE FOR THE INTEGRATED FACILITIES SYSTEM (IFS)

Another Army system which might have some application in several aspects of base development is the New Construction Module of the IFS. The New Construction functional system was conceptualized and developed to be principally an automated assist to planning, programming, budgeting, execution and performance evaluation activities pertinent to the several military construction programs. The IFS addresses Army facility assets in terms of:

1. Assets in being.

2. Assets under construction or funded and/or authorized for construction.

---

[60] U.S., Department of the Navy, The STINGER System, Publication, NAVFACENGCOM: Port Hueneme, California, n.d.

3. Assets planned for construction.

The New Construction management area is concerned with information input, storage, and output for the facility assets in Categories 2 and 3 above. It also includes land acquisition insofar as it may be considered an asset being planned, funded, or authorized for acquisition.

The New Construction functional design has been developed to provide the following:

1. A single data base of all relevant IFS information for military construction programs (regardless of appropriation).

2. Update of military construction program data in the data base without repetitive submission of unchanged data.

3. Compilations of short -, intermediate-, and/or long-range military construction programs reflecting program budget guidance and command project priorities.

4. Rapid retrieval of other information (e.g., status information on each construction project) in all phases of progress from initiation to completion.

The functional design achieves the objectives by using existing New Construction systems. Construction programs and projects are visible on a line-item basis at all levels from installation through Congress. It is possible to specifically define the contemplated Army construction package, worldwide, by an examination of the conglomerate Short-, Intermediate-, and Long-Range Construction Programs (SRCP, IRCP, and LRCP, respectively). These programs are available and share common information characteristics. They are related and directly react to force planning guidance in measurable features.

The functional design provides for extracting Army New Construction information from existing management systems for input to, and use by, the IFS. The design addresses all construction programs and

construction management functions (planning, programming, budgeting, execution, and performance evaluation) by major echelon. It presents the functional flow, characteristics of the individual functions, and data requirements. Further, it identifies output requirements.

The New Construction data are placed in the IFS data base to be available for use in either the New Construction or other IFS management areas for problem analyses, requirements identification, or assets reporting. The functional design identifies the New Construction information needed for the IFS data base. This information is available to facility managers at each echelon in performing their planning, programming, budgeting, execution, and performance evaluation functions. The data base may be accessed for facility management purposes, normal reporting, or specialized requirements.

The New Construction functional design reflects the information needs at four echelons:

* Installation
* Major Subordinate Command (MSC)
* Major Army Field Command (MAFC)
* Headquarters, Department of the Army (HQ DA)

The design is subdivided into these four echelons for purposes of presentation but shows the information flow and processing between each echelon. By direction, execution information (design and construction status) is obtained from Office, Chief of Engineers (OCE), not the District or Division Engineers.

The design accomplishes a major change in processing from the current New Construction program system; using automation assistance at each echelon, it provides a continuously updated information base for use in program development.

The new program development system is based on an integrated data base to be used in preparing annual, intermediate, and long-range programs. This data base includes:

* Installation Master Plans
* New Construction project data
* SRCP's, IRCP's, and LRCP's
* Design and construction status data

The design is as follows.

Based on an analysis of total construction requirements to support forces, permanent, semipermanent, and temporary construction needs are accumulated into a new guidance document, the Army Stationing Plan for New Construction (ASPNC). This replaces the current Stationing Plan for permanent Construction and the accumulation of specific construction projects developed in response to contingency, including Joint Chiefs of Staff (JCS) plans and special requirements.

Installation Master Plans are developed based on the guidance contained in the ASPNC. These master plans are used to develop New Construction programs in three segments: the SRCP for the target budget year, the IRCP for the 5 years of the Five-Year Defense Program (FYDP), and the LRCP for the remaining years of the Installation Master Plan.

DD 1391's are prepared in varying degrees of completion for each project in each of the three program segments, i.e., SRCP, IRCP, and LRCP. The degree of completion in general is: for the SRCP, fully complete, including separate 10-paragraph justification, site plans, and cost estimates; for the IRCP, approximately fully complete in the 2d and 3d years, with the 4th- and 5th-year projects requiring less detail and less justification; and, for the LRCP, only brief description data.

Data from these forms are extracted and placed in the automated New Construction files using the line item and temporary line item numbers (LIN and TLIN) as audit trail identifiers. Changes and updates, as well as annual program development, are achieved by submitting these actions (by TLIN or LIN) for approval at HQ DA. Suspense files are prescribed for tracking actions (by TLIN or LIN) at each echelon until HQ DA takes action; at that time, the files at each echelon are up-dated. Final action by the Office of the Secretary of the Army (OSA), Office of the Secretary of Defense (OSD), and/or Congress is also put into files by TLIN or LIN. At each annual program submission (SRCP), input for the LRCP add-on year is prepared and entered into the system by TLIN.

Status data, either project development design or construction progress, as well as fund information for the total budget cycle (appropriation, obligation, and expenditure), are accumulated in the New Construction file by TLIN and LIN.

Information retrieval may be by: project; program funding, i.e., Military Construction, Army (MCA), Military Construction, Army

Reserve (MCAR), Military Construction, Army National Guard (MCARNG), Minor Military Construction, Army Reserve (MMCAR), Minor Military Construction, Army National Guard (MMCARNG), Family Housing Management Account (FHMA), procurement of equipment and missiles, Army (PEMA), or research, development, and evaluation (RDT&E), AAFE and MPS and other nonappropriated funds; facility category, e.g., barracks, hospitals, utilities; funding status by appropriation, obligation, and expenditure; action status, i.e., command action, HQ DA action, or congressional action in the form of approval, disapproval, or deferment, with appropriate subroutines and cost information for use in programming, budgeting, and estimating; or any other item in that data base.[61]

Although this system is obviously not designed for contingency construction, it appears to have application to an RVN-type funding situation, where the entire construction program was closely and centrally controlled at DOD level.

EUROPEAN THEATER NETWORK ANALYSIS MODEL I (ETNAM I)

Numerous other ADP systems are available, which show promise of performing a supporting base development role. One of these is the ETNAM I System, which has been carefully designed as a general purpose network analysis mode. The solution algorithm, which was named Resource Allocation and Chain Analysis Technique (RACAT), is a procedure based

---

[61] Planning Research Corporation, "New Construction Module Analysis and Design for the Integrated Facilities System", Study, Vol IV: Washington, D.C., December 1969, pp. I-1 through I-7.

on a combination of the simplex algorithm of linear programming and the shortest chain algorithm of graph theory. This technique is the central module of the ETNAM I System. In addition, rudimentary INPUT and OUTPUT modules have been designed to complete the model as a data processing system.

The problem originates with the user who prepares the necessary input data. Network and resource data are somewhat fixed for the particular theater of operations and should not require any significant alterations. An analyst familiar with the algorithms and operation of the system modules is required to finalize the data preparation process and determine how the system should be operated.

ETNAM I is an operational system designed to accept punched cards as the input medium. All files are magnetic tapes except a disk work file in the OUTPUT MODULE. Within the limits of practicality, the computer programs will be written in FORTRAN so as to facilitate conversion to a computer configuration other than the RAC CDC 6400 if desired.

While ETNAM I has been specifically directed towards use in Europe, its usefulness is not limited to the European Theater or even to strictly intratheater problems. The ETNAM I system and the theater-oriented input data are separable. While aimed towards use in the European Theater, that orientation has consisted of determining the size of the network to be analyzed and the variety of modes and resources to be handled. There is no reason why the ETNAM I model cannot be applied to any theater in which networks and resource allocation problems must be analyzed. In addition, the model could be applied to an overall network study of the movement from origins in the CONUS to destinations

within the Theater, provided that the requisite networks may be represented within the size limitations of the model.

ETNAM I is capable of assisting in two types of studies: first, there is the "capabilities" mode in which the user desires to compute the capability of the transportation network and the available mobility resources to sustain a multi-commodity flow. Alternatively, there is a "requirements" mode in which the user wishes to determine the set of routes and allocation of mobility resources necessary to meet the delivery requirements. In this second case the delivery requirements by origin/destination pair are specified and the relative value (or price) of the resources is used to obtain the least cost mix of resources needed to accomplish the movements.

These two operational modes are designated as maximization of flow and minimization of cost respectively. In addition, the system may be used to minimize time or to allow for the substitution of resources.[62]

Used in support of other BDP systems, it appears that ETNAM I could be of considerable value in planning construction within a theater of operations, as it could provide very definitive data on the route priorities and the degrees to which LOC development was needed.

<u>GROSS FEASIBILITY ESTIMATOR MODEL (GFE-III)</u>

GFE-III is a digital computer program of a mathematical transportation model. Like ETNAM I, it appears to have excellent support potential in the area of BDP&E.

---

[62] Research Analysis Corporation, "ETNAM I (European Theater Network Analysis Model I", Study: McLean, Virginia, August 1969, pp. 1-1 and 1-2, and 2-1 through 2-6.

The GFE model, written in FORTRAN IV, has been developed to provide the Deputy Director for Logistics (Strategic Mobility), J-4, Joint Staff with a high speed, computerized program to be used as a planning tool in analyzing the effectiveness of various levels of transportation resources in carrying out a deployment of cargo and troops. The model will simulate the simultaneous deployment of movement requirements by air and/or sea modes with multiple points (origins, ports of embarkation, and ports of debarkation). These points are not restricted to any specific geographical location and, therefore, may represent any location the user desires.

The GFE model will simulate a deployment while operating under various conditions affecting time, resources, and facilities. These conditions may include such things as: land, air, and sea distances between points, speeds, shipping attrition rates that may vary in time and rate, cargo constraints at seaports, sortie constraints on airports, and the variation of constraint size over varying periods of time.[63]

ESTIMATING THE COST OF RELOCATING MILITARY BASES (JOSS)

Our foreign base structure is designed to allow the presence (or at least the capability of timely intervention) of U.S. military forces and to provide for their continued support in areas of the world which are deemed to warrant such action. As world conditions change,

---

[63] National Military Command System Support Center, "Gross Feasibility Estimator Model (GFE-III)", Technical Memorandum Number TM 57-70, Cameron Station, Virginia, August 1, 1970, p. 1.

our base configuration needs to be altered to conform to changes in the expected location of trouble spots, to the attitudes of the host nations which furnish the base real estate, and to technological advances in weaponry and logistics support. Recently, studies were undertaken at the Pentagon and at RAND to determine whether certain overseas bases should be reduced in scope or phased out and others established in geographical locations better suited to present circumstances.

The decision to withdraw our military forces or our support functions from a given base and to re-establish them at another location is likely to result in a not-inconsiderable cost. Naval and air bases in particular represent very large investments.

Factors that have a direct bearing on the magnitude of relocation costs include the number and size of the organizations that must be moved, the distance that the men and materiel must be transported, their facility requirements balanced against the existence of any suitable, vacant facilities at the new location, any significant changes in the forces or in the equipment needed to perform their missions from the new locations, and the geographical location of the new bases — which determines the level of construction costs.

The RAND Corporation has formulated a procedure for the systematic examination of the more important considerations that influence relocation costs. In addition, sources of pertinent information are identified. The methodology is designed primarily for the development of rapid preliminary estimates using standard references. The purpose is to

provide insights into the probable costs incurred by a base relocation and to identify the interesting alternatives that merit a more thorough analysis.

JOSS[64] programs have been developed to assist in the calculating of construction costs. These programs produce estimates of construction costs primarily on the basis of the type and size of buildings and other facilities to be constructed and appropriate costing factors found in service construction cost guides. Total costs and capacities (e.g., square feet) for the various types of facilities are tabulated and printed by base, by military service, and by total country or area.[65]

A BRANCH-BOUND ALGORITHM FOR THE CAPACITATED FACILITIES LOCATION PROBLEM

Another support program closely related to the JOSS system is one developed by Union Carbide Corporation for solving the Facilities Location Problem.

This problem involves determining from a predetermined finite number of potential sites the location and size of new facilities, i.e., warehouses, plants, and the like, so as to minimize total distribution costs. These costs consist of:

1. the investment and operating costs of the facilities, and
2. the inbound/outbound freight costs.

---

[64] JOSS is the trademark and service mark of the RAND Corporation for this computer program and services using that program.

[65] The Rand Corporation, "Estimating the Cost of Relocating Military Bases", Technical Report, Los Angeles, California, May 1969, pp. iii-v, and 17.

Union Carbide has developed a mixed integer programming method for solving the Facilities Location Problem with capacities on the facilities. The algorithm uses a Decomposition technique to solve the dual of the associated continuous problem in each branch-bound iteration. The method was designed to produce the global optimum solution for problems with up to 100 facilities and 1,000 customers.[66]

This system appears to have potential, in conjunction with systems such as JOSS, for assisting in optimizing the selection of overseas bases.

CONSTRUCTION PROGRAM SOUTH VIETNAM (COPSOV)

In addition to the ADP systems discussed, many of the Unified/Specified Commands and their subordinate commands have developed ADP systems to aid in BDP&E. COPSOV is an example of such a system.

The COPSOV system calculates construction requirements to listed assets of each facility by service for the 18 major locations in South Vietnam. Output reports are generated listing construction requirements, assets, deficiencies or excesses of each facility by service for the 18 major locations, 4 major complexes, and the entire country of South Vietnam.[67]

MISCELLANEOUS SUPPORTING PROGRAMS

A number of promising supporting systems have been developed which have application primarily in the area of base development execution.

---

[66] Union Carbide Corporation, "A Branch-Bound Algorithm for the Capacitated Facilities Location Problem", Technical Report, n.d., p. 331.

[67] U.S., Department of Defense, Command Manual for Construction Programs South Vietnam (COPSOV), Military Assistance Command, Vietnam, July 15, 1969, p. i.

For example, a system for selecting the final alignment for roads and airfields using ADP techniques has been proposed.[68]

Also, at least two applications of computerized network analysis techniques, one for use by the Army Engineer in planning detailed execution of construction and combat support tasks,[69] and the other for use by engineers in the Communications Zone.[70] Another example already implemented concerns use of computers for measuring quantities of earth to be moved in dredging operations throughout RVN. An existing ADP program for making heavy earth moving computations was modified and adopted for use in underwater earth movement calculations. This alone resulted in a savings of $18,000 per year.[71]

SUMMARY

The PRESCORE, STINGER and SIGMALOG (Construction model) systems all have the ability to recycle quickly and analyze the implications of alternative force developments and support concepts. They provide the

---

[68] Gurnie C. Gunter (Maj., U.S.A.), "Automatic Data Processing for Selecting Final Alignments of Roads and Airfields and Scheduling and Controlling Road and Airfield Construction", Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1967.

[69] Francis J. Walter, Jr. (Maj., U.S.A.), "The Application of the Network Analysis System in Operational Planning by the Field Army Engineer — A Doctrine", Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1965.

[70] Gurnie C. Gunter, Op. Cit.

[71] H. J. Johnson (Rear Adm., U.S.N.), "Management of War Zone Construction", Defense Management Journal, 5, No. 3 (Summer 1969), 47.

capability of making phased construction forecasts (men, materials, equipment) with minimum effort, thereby making base development plans very responsive to actual situations. The IFS system appears to have promise in assisting BDP&E in the programming, funding and budgeting areas. Numerous ADP programs have been developed which, if properly applied, can materially assist joint force commanders in execution of base development construction.

However, how well the potential of ADP is realized in the area of BDP&E will depend to a large extent on solution to the following problems:

1. Education of planners and engineer staff personnel in ADP techniques; right now, the CINCPAC staff is the most knowledgeable Unified Command staff, as a result of experience gleaned in Thailand, Vietnam, and Korea. Resorting to civilian contractors or specialists to operate the system does not always result in believable output. The judgment of skillful, experienced military planners needs to be interjected at certain critical points.

2. Attitudes of some senior officers must be modified through education, to accept a planning system hidden in a memory bank or tape library of a computer unit.

3. Present major systems are oriented to base development planning and projection of deficiencies which can be converted into program and budget requests. To be fully responsive to the entire construction process, a single system must be developed which will consider planning, programming, budgeting, execution and reporting of construction during contingencies.

4. Each unified command currently has a different ADP format; economy dictates that a high degree of standardization of input/output be realized.

THINGS LEFT UNDONE

Based on lessons learned, numerous improvements have been made in the BDP&E process. Several study groups have looked at the problem and recommended changes; much has recently been written on the subject. DOD has consolidated and published its planning guidance; JCS has standardized the base development plan format, largely emulating the format developed by the CINCPAC staff in the mid-60's. A joint construction board has been established to monitor progress in BDP&E. The Army is in the process of publishing new base development doctrine and up-dating the obsolete Engineer Functional Components System. It is in the process of preparing standard Army Component BDPs in each of the Unified Commands, and standardizing criteria and planning factors. It also has a fully tested ADP system useful for BDP&E. The Navy had developed the STINGER system, which shows promise for use in BDP&E. DOD has also developed the PRESCORE ADP system, capable of solving BDP&E problems for all the Services in a variety of scenerios. The Air Force has developed its very progressive Bare Base Mobility concept, which is a giant step forward in the field of relocatable, modular, pre-engineered, pre-fabricated structures. Progress has also been made in the areas of pre-fabricated deep-draft piers, airfield matting, pre-fabricated pontons and many other pre-engineered construction

components as a result of the Vietnam Conflict. Many other ADP applications to assist base development execution have also been discovered. Although the effectiveness of these developments cannot yet be evaluated, it seems reasonable to expect that most will contribute to a substantial increase in construction responsiveness.

However, the situation is not as favorable as it appears. There are still many matters that need to be resolved and corrective actions that need to be implemented. In discussing these, it appears appropriate to begin by commenting on certain aspects of the BDP process that should be considered in the development of joint and Service plans.

Base development plans in the past have been characterized by an inherent inflexibility; they have been based on a fixed scheme of maneuver and on a given force level. Sometimes they have contained too much detail, even to the point of master planning installations. This approach is ill advised for two major reasons. First, significant deviation from operational plans must be expected. Second, there is an opportunity to adopt previously determined, and subsequently determined, gross construction requirements to actual field needs immediately following D-day. Construction during the first 3-6 months of an operation (lodgment) consists mainly of combat support and expedient work to meet immediate operational and logistical needs. During this period, engineer planners can develop more detailed plans as the actual employment of forces in the theater becomes more firm. According to the Besson Board, an appropriate BDP system should contain four key elements:

1. An inventory of existing assets in the proposed area of operation and detailed climatological and topographical data.

2. Identification of immediate construction requirements to permit implementation of the operational plan, e.g., port clearance, port construction, and expedient airfield construction.

3. A system capable of determining gross facility requirements, material and equipment requirements, troop and contractor effort requirements, and funding required under variable parameters of force levels, locations and type of operations, and climatic conditions. Particularly for logistic facilities, the system should be capable of developing requirements on a "construction slice" basis. For example, a change in port theoretical through put requirements should generate gross requirements data for piers, staging areas, depot storage, and similar items.

4. A plan for augmenting engineer staffs during the early stages of the buildup to adopt the gross requirements generated by the system to field conditions.[72]

Other essential features, according to the Board, are:

1. It must be adaptable to ADP.

2. It must be compatible with Joint Chiefs of Staff instructions for base development planning and subsequent changes.

3. The several Service systems should have no Services interface problems.[73]

The JLRB notesthat progress on the important and urgent tasks enumerated above has not been apparent.[74] The Commanding General, U.S. Army Materiel Command has stated in this regard: "Impact from these efforts on this command are not discernable".[75]

The JLRB review of the minutes of the Construction Board for Contingency Operations substantiates the lack of real progress. The

---

[72] Logistics Support in the Vietnam Era . . ., Op. Cit., p. 42.

[73] Ibid., p. 43.

[74] Ibid.

[75] Ibid., as contained in U.S. Army Material Command Letter, AMCRP-G, subject: Modern Base Development Facilities Components, March 4, 1970.

absence of a full-time engineer staff with advisory functions at the JCS level is a repetition of the inadequate contingency construction staffing that generally existed just before the RVN buildup. Although the tasks presently assigned to the Construction Board for Contingency Operations are significant, the JLRB believes there are other important efforts that are not presently designated. These include:

1. More extensive coverage of the Services' activities to insure that there is a complete exchange of knowledge concerning the construction aspects of base development planning to include planning systems and the progress of the Services' R&D programs for functional components and retrievable, pre-engineered structures.

2. Assistance to the Services and the Commanders in Chief in identifying interface problems regarding base development planning related information.

3. Monitoring of progress in regard to standardization and planning factors.

4. Monitoring the status of actions taken to overcome major construction deficiencies identified in base development plans to include the availability of specific construction materials and equipment assets of such critical importance that the lack of them would limit significantly contingency plan implementation.[76]

Other significant potential improvements recognized by the Besson Board and others, which have not as yet been adopted provide that:

1. In the case of plans for major contractor effort, the requirement contained in the instruction for base development planning in support of joint operations, recently issued by the Joint Chiefs of Staff (SM-643-69), be expanded to require, as appropriate, such specifics as:

* The time-phased plan for the mobilization of the contractor level of effort.

* The number and types of contractors to be employed.

---

[76] Ibid.

* The degree to which the contractors are to be administratively and logistically independent (e.g. in such areas as procurement of construction materials and transportation.

2. The Joint Chiefs of Staff instructions — (SM 643-69) require specific provisions for the coordination and control of construction in the combat area . . . The planning should set forth the composition and role of a construction directorate on the staff of the joint field commander if warranted by the scope and complexity of the contingency.

3. The contingency reporting system under development by the Joint Chiefs of Staff stress simplicity, reduction of information requirements to key elements pertinent to a combat situation, capability for expansion without major changes in automatic data processing programs and format, and compatibility with the program and funding management requirements of the Services.

4. — the Office of the Secretary of Defense should develop — a completely new appropriation with established formats, programming procedures, and limitations specifically tailored to achieve an optimum balance of flexibility, responsiveness, visibility, and good management. This appropriation would be temporary in nature and applicable only during the contingency situation. It is suggested that such an appropriation be called "Contingency Construction Appropriation" — based on the following:

* Definition of programs on the basis of gross requirements identified by a limited number of standard Department of Defense facility category groups.

* Appropriation of funds commensurate with the level of effort to be mobilized and maintained, in keeping with the gross requirements, the completion schedules, and the troop/contractor mix.

* Introduction of line item identification at the construction directive stage of program execution.

* Authorization to make exceptions to "full funding".

* Allocation of construction funds in a single account for each Service without fiscal year identification of follow-on funds. Such follow-on funds should be additive to the accounts applicable to facility category groups in the total program.

* Control of construction above the unified command level not based on detailed line item approval but exercised through broad guidance and veto power, with base "Complex Review" and established reporting systems providing the necessary data for decision making.

5. Construction programing procedures to be employed in future contingencies be developed in advance between the Department of Defense and the appropriate congressional committees and that legislative proposals be drafted to implement the procedures agreed upon.

6. The instruction issued by the Joint Chiefs of Staff — (SM 643-69) include consideration of the establishment of an in-theater forward depot geared to regulate (hold and forward on call) the flow of selected construction materials for each plan developed.

7. The Services, through the Joint Logistic Commanders, take under study the feasibility of the establishment of war reserve pools of critical commercial type construction equipment to be managed and rotated by the manufacturers concerned.

8. Initial provisioning of repair parts for construction equipment be reviewed by the Services with a view to increasing accompanying and follow-on spares to a level commensurate with realistic combat construction experience.

9. The Office of the Secretary of Defense, in coordination with the Department of State, establish a file of draft real estate proposals suitable for the most likely host nations.

10. The Services establish simplified procedures for requesting and approving construction in the combat zone.

11. Following the development of [joint] construction standards and planning factors by the Construction Board for Contingency Operations, operation plans and implementing orders specify the standards to be used and provide necessary judgment to adopt standards and factors to the circumstances of the plan.

12. Contingency planning provide for adequate organic construction capabilities and appropriate delegation of authority to permit commanders to accomplish minor, urgent construction projects in a timely manner.

> 13. Contingency plans and base development plans address the way in which Army troop construction support will be provided to meet Air Force requirements.[77]

Further, key recommendations made by the Special Military Construction Study Group three years ago and supported by the Joint Staff which were relegated by the JCS to "further staffing", and have not as yet been implemented are:

> 1. That the Joint Chiefs of Staff clarify matters relative to directive authority contained in — JCS Pub 2, by revising the wording — to insure the understanding that commanders of unified/specified commands will have directive authority over construction when required by a contingency situation and when approved by the Joint Chiefs of Staff.
>
> 2. That an integrated system for base development planning and construction execution be developed —.
>
> 3. That the Joint Chiefs of Staff determine the requirement for a joint ADP system to support the construction process.
>
> 4. That a contingency construction reporting system, compatible with the joint ADP system supporting the construction process and existing Service status reporting system using current Service ADP outputs whenever possible, and supplemented by summary reviews, one-time reports and on-site inspections —.[78]

---

[77] Ibid., pp. 194-198.

[78] U.S., Joint Chiefs of Staff, Unlettered, Untitled Appendix to the Report by the Special Military Construction Study Group: Washington, D.C., February 10, 1969, pp. 1-12.

Chapter IV

A PROPOSAL FOR JOINT, INTEGRATED BASE DEVELOPMENT PLANNING AND EXECUTION

To increase readiness and responsiveness; reduce waste, inefficiency and duplication of effort; and increase the effectiveness and quality of construction execution in support of future contingencies, the development of a joint, integrated system of base development planning and execution is clearly in order. This system should be designed to eliminate or minimize the problems encountered in Asia during the past decade. It should incorporate the latest, most modern and up-to-date technology and techniques available, yet be so structured as to provide only minimum essential construction consistent with the nature, scope, and complexity of operations, and the state-of-the-art in the field of logistics. Emphasis must be on speed, responsiveness, and simplicity of construction, supported by a corresponding streamlining of procedures, effectiveness and economy. The system must encompass all aspects of base development planning, programing/budgeting, authorization and funding, and execution of contingency construction.

The system being proposed by the author to serve as a framework for curing existing base development planning and execution ills incorporates several new concepts:

1. Establishment of an appropriately sized, knowledgeable base development planning staff at all levels, from Service Component to JCS/DOD, to be augmented as needed upon implementation of a contingency mission.

2. Establishment of a Joint Contingency Construction System (JCCS) of functional components which is adaptable to all environments, to be used by all Services for both planning and execution.

3. Development, in conjunction with the JCCS, of a uniform system of construction standards and planning factors and criteria.

4. Programming contingency construction, based on Gross Facilities Requirements, through the Joint Chain-of-Command, and coordinating with the Services and their components at each level of review.

5. Contingency Construction Appropriations authorized by Congress are passed by the Secretary of Defense through the Joint Chain-of-Command to the appropriate joint commander in the theater of operations for allocation as deemed appropriate.

6. Construction requirements are programed and funded in terms of a level of construction capability based on gross facilities needs and level of effort.

7. Streamlined contingency programming/funding and real estate procedures with supporting documents, are pre-prepared.

8. The entire planning/execution process is supported by a joint automated data processing system (JADPS) which accelerates and simplifies planning, monitors construction progress, determines problem areas and corrective actions required and prepares reports as needed to keep decision makers at all levels informed. This system is used by all Services and commands.

THE PLANNING SYSTEM

The base development planning process proposed is dynamic and recycling; it is updated regularly. It should simplify and improve

planning; reduce reaction time for changed conditions; and provide a more creditable justification for funding and prestocking War Reserve Materials (WRM), and maintaining a proper troop construction capability. The workings of the system, in chronological sequence, are described below.

DOD - Prior to hostilities, transmits broad planning guidance to the JCS regarding improvement of existing bases and construction of expanded bases in support of OPLANs. Also, it maintains a staff cognizant of base development matters, and, in coordination with the Department of State, develops a file of draft real estate proposals suitable for the most probable host nations. Further, in cooperation with Congress, develops emergency programming/funding procedures to insure responsive "Contingency Construction Appropriations" in an emergency.

JCS - In consonance with DOD guidance, issues policy guidance and mission directives to theater (unified or specified) commanders. At the same time, JCS develops and maintains a strong base development planning staff, which supervises the formulation of joint base development doctrine; standards and planning factors; and insures development, procurement and maintenance of joint functional component and joint ADP systems.

CINC (THEATER) - In conjunction with JCS mission directives and other joint guidance, such as the Joint Strategic Objectives Plan (JSOP), the Joint Strategic Capabilities Plan (JSCP), the United States Base Requirements Overseas (USBRO) and JCS Pub 3, issues planning

guidance and allocates resources for planning purposes to the joint subordinate commander. The bulk of the theater commander's guidance is incorporated in a Base Development Study and a Base Development Planning Directive, utilizing the CINC's BDP staff. Particular attention is given to providing the latest engineer intelligence, both land and sea, pertinent to the area of operations.

JOINT SUBORDINATE COMMANDER - In consonance with the directions and information provided, issues more detailed guidance and direction, including allocation of construction resources for planning, to the subordinate component commanders.

SUBORDINATE COMPONENT COMMANDERS - Develop detailed base development plans and determine requirements for their components. In preparing plans, maximum coordination is effected with other component commanders to plan for the utilization of joint-use facilities as much as feasible. If additional expertise is needed locally to prepare the base development plan, consideration is given to requesting a "tailored" temporary duty planning team initially through Service channels, and if unavailable, then through Joint channels.

In developing the detailed plans, recognition is given to the fact that a contingency operation can be divided into three distinct phases: the Lodgment phase, the Consolidation (buildup) phase, and the Operations phase.

The Lodgment: Provides for those essential improvements and new facilities needed to introduce a force into an area. Planning for this phase is essentially concerned with the availability or development

of initial logistical facilities, such as ports, airfields, pipelines and certain depot facilities; and essential command and control facilities, such as hardened command posts and communications centers. Major bottlenecks on the lines of communication are also of concern.

The Consolidation: provides for those essential improvements and new facilities needed to establish a force in an area. Typical construction during this phase would be expansion of logistical facilities, improvement and new construction of the major road network and building of additional hospitals; and upgrading and expansion of command/control facilities, such as construction of an inventory control center.

Operations: provides for those essential improvements and new facilities needed to sustain a force in an area. Construction tasks included in this phase are such things as upgrading of administrative, operational and logistical facilities; improvement of troop housing and the expansion of welfare/morale facilities, such as exchanges, theaters, clubs and other recreational facilities; and the extension of the LOC system.

In consonance with DOD guidance, within each of the above phases a priority system, as follows, based on broad categories of need, is used:

1. Operational and logistical facilities.

2. Personnel support facilities including cantonments (only essential facilities, e.g. shelter, mess, sanitation).

3. Personnel support facilities (improved living conditions).

4. Welfare and recreation facilities.

Subordinate component commanders compute their overall requirements to support the operations using the Gross Requirements techniques. However, planning is very detailed for the Lodgment phase and becomes progressively more general for the Consolidation and Operations phases.

For the Lodgment phase, all facilities are selected from the JCCS. Specific real estate is selected and negotiations with the host government are planned or conducted consistent with security considerations. Facilities are site adapted and detailed estimates of labor, equipment, materials, shipping weights/cubages, cost estimates and construction times are prepared. Requirements for long-lead-time equipment are identified in detail, as well as requirements for desirable pre-hostilities construction to support the OPLAN. Planning for the Lodgment phase must also consider replacement or repair of existing facilities damaged upon initiation of hostilities.

For the Consolidation and Operations phases, as many facilities as possible are planned using the JCCS. Those facilities which are not available through the JCCS are planned for production outside the Theater of Operations, preferably in CONUS. Tentative site locations are selected to the extent practical. Unusual or highly sophisticated construction needed during these phases is considered for contractor construction. In determining the best troop/contractor mix, ORSA models and techniques are incorporated as needed. Consideration is also given to use of local labor to the maximum extent feasible. For the Consolidation phase site adaption is used in planning to the degree

necessary to insure that long-lead-time items, or tasks calling for specialized units, such as well-drilling teams, are identified. Material and equipment requirements, in terms of tonnages for transportation planning, are readied. Use of local materials to the maximum must be balanced against the undesirable effects of balance-of-payments deficits and inflation within the host country. Construction force troop lists are prepared, along with estimates of the size and types of contractor forces that might be needed. For the Operations phase, only general forecasts of materials and transportation are prepared, along with construction troop lists. Only general locations of additional facilities and improvements are shown in the BDP. Upon implementation of the plan, the detailed planning, design, and obtaining of specific real estate would be done by the forces deployed in the TO as normal construction support.

After the shortfalls in construction forces, materiel and funds needed to support the OPLAN have been identified by the subordinate component commanders, the BDP is forwarded to the Subordinate Joint Commander.

SUBORDINATE JOINT COMMANDER - Reviews, coordinates and consolidates the component BDPs into an integrated system. Also, adds any requirements not planned for by components, and coordinates with the DOD designated construction agent in the area concerning the contractural aspects of the BDP. This planning includes provision of augmented joint staffing of the DOD designated construction agent upon implementation of the OPLAN.

The components' BDP retain their separate Service identification for ease of review at higher commands; however, a summary joint command plan that includes the following is added:

A joint command integrated priority list of BDP construction requirements.

Consolidated peacetime needs for intelligence, facilities, forces, and material for use by higher commands in programming peacetime budgets.

The joint command commander's general evaluation of limitations on operations imposed by shortfalls in BDP and proposed solutions for overcoming these shortfalls.

CINC (THEATER) - Reviews, with the Component Commanders, the BDPs submitted by the joint subordinate commanders and adds Service theater construction requirements to support the BDPs. He also coordinates with the DOD designated construction agent at theater level concerning joint staffing and contractural considerations. This coordination should provide for the use of existing standard designs by contractor forces to the maximum extent practical, and the use of a minimum of contracted Architect/Engineer augmentation.

Further, the theater BDP staff coordinates and integrates the joint command BDPs into a single plan that eliminates conflicts, overlaps, gaps, and other deficiencies.

The staff consolidates component requirements into a single priority list. The component plans are all modified to agree with the theater commander's BDP, but they retain their Service identity for

review. Once these tasks have been accomplished, the theater BDP is forwarded to the JCS.

JCS - Review, modify as needed, and finally approve, with the Services, the Theater BDP. Comments indicate those requirements of the approved BDP that may be included in Military Department programs in peacetime.

Also, JCS coordinates with DOD on the establishment of a construction director in the theater of operations if required upon OPLAN implementation. This director, if needed, is provided with strong "Vietnam Era" powers, expanded with the addition of responsibility for control of all construction, regardless of funding source. This will include O&M, AID and MAP funded projects. Also, any advisors with host country military organizations conducting U.S. funded construction should come under the operational control of the construction director.

THE SERVICES - Review the theater BDP, particularly that portion produced by their respective Service, assess the plan for supportability and:

1. Add out-of-theater construction requirements to support the plan. These requirements normally consist of such things as, the expansion of modification of training facilities for production and supply facilities in CONUS. These considerations must be coordinated with the Installation Master Planning system.

2. Insure that construction forces in-being are designated to support certain OPLANs, and are trained to include the execution of TO type construction in CONUS. Insure that requirements for construction

resources, both military and civilian, are identified, and arrangements made for their mobilization as needed. This includes provisions for CONUS based prefabrication facilities to furnish direct support to the TO.

3. Recommend to the JCS any reallocation of critical resources.

JCS - Determine the allocation of resources to support the various theater OPLANs, based on recommendations of the Services and considerations presented by the CINC's; also, send the CINC's the approved BDPs, and assume control of critical resources. Emphasis is placed on allocation of transportation resources to support construction, e.g., LASH, Liberty ships, R/O-R/O ships, containerized ships, floating depots, and strategic airlift. Further, in conjunction with normal OPLAN testing procedures, insure that the corresponding BDPs are also selected and tested.

SERVICES - Insure that critical resources are allocated in accordance with JCS guidance.

CINC (THEATER) - Adjusts his plans and resource levels in accordance with JCS comments and reallocation of resources. He then passes the JCS-approved plan, with his comments, to the subordinate commands. The theater commander directs any necessary revisions of the original BDP, detailed supporting plans, and construction execution plans.

SUBORDINATE JOINT COMMANDERS AND THE COMPONENT COMMANDERS -

Adjust their BDP in accordance with the theater commander's direction.

Revise detailed logistic support plans and construction execution plans.

Use and adjust construction resources in accordance with theater commander's instructions.

Reassess requirements for support in terms of adjusted assets and submit adjusted requirements to the theater commander.

Periodically (at least annually) reassess the BDP in accordance with changes in resources, assets, and/or requirements and recycle the BDP, with recommended changes to the theater commander. The listing of forces, materiel, and fund requirements is maintained current; and all levels of command are kept current and are advised. The annual review of their BDPs by the component commanders retriggers the entire process from below.

THE SERVICES - Concurrently with theater adjustment actions, collate worldwide requirements for BDP support. They then recommend force levels, materiel reserve levels, and peacetime funding programs for the support of approved BDP's to the JCS. The recommended level of support is not the total of all approved plans, but is a level that includes enough resources for prosecuting those contingencies considered by the JCS as most appropriate. Some resources will be allocated for support of specific plans, but the bulk of the resources requested by the Services will be held in reserve for general support throughout the world. This planning includes use of the DOD designated construction agent and civilian contractors, as outlined in the approved BDP's, and also provides for establishment of forward depots as needed.

In accordance with the budget process, each service prepares and supports its programs through the Office of the Secretary of Defense (OSD) to the Congress. The Service programs reflect the peacetime facility requirements of approved theater command BDP's. Any contemplated change by a Service to the theater commander's approved requirements for contingency support is referred to the theater commander for review. Unresolved differences are referred to the JCS.

When funds are appropriated, the Services:

1. procure supplies and equipment to maintain in-being resources that are administered through departmental channels.

2. recruit, organize, equip, and train new troop construction units that may reinforce a specific theater commander or may be kept in CONUS for general support.

3. equip and train the Ready Reserve construction units that may be called up during mobilization. Also, identify reserve type contractors forces useful both in CONUS and the various theaters during implementation of an OPLAN.

4. procure reserve materiel. Most of the materiel will be long lead time, long shelf life elements of the JCCS placed in general reserve or prepositioned in various theaters and rotated with operating stocks during peacetime, consideration should be given to using obsolescence pre-stocked materiels for national disaster or other emergency assistance whenever possible.

The Services also recommend distribution of departmental resources to the JCS for their use in the preparation of the Joint Strategic

Capabilities Plan (JSCP) and other JCS actions and transfer Military Construction Program (MCP), and Military Assistance Program (MAP) funds to the designated DOD construction agents located in-theater for peacetime contract construction of facilities.

The DOD construction agent executes the MCP and MAP contracts through field offices which coordinate the construction of facilities with the theater commander and/or the joint/component commanders and transfers the facilities to the component commands on completion of construction. Some funds may also be transferred to the components for use by troop units involved in MCP construction.

JCS - Recommend resources levels to DOD for support of the National policy. Based on input from the Services and DOD, the JCS develop a new Joint Strategic Capabilities Plan (JSCP) and Joint Strategic Objectives Plan (JSOP). The new JSCP may list new tasks that will require a new BDP, and the planning process is repeated for those tasks. Most tasks in the JSCP will not have changed significantly and will not require new BDP's. Newly created resources will be entered for recycling as appropriate.

DOD - The Secretary of Defense relays recommendations on force levels to the President. New guidance is then formulated that starts the BDP process recycling from the top.

Through the budget process, OSD receives authorizations and appropriations from Congress, assigns authority, and allocates funds to the Services for supporting BDPs.

PROGRAMMING AND FUNDING

The objective of base development programming is twofold:

1. To support the requirements for base development in a theater of operations.

2. To serve as a vehicle on which to base Congressional authorizations and appropriations in the annual funding cycle.

Base development requirements are derived from the base development plan (BDP) and form the basis for initiating budget requests. When the requirements and standards of construction have been determined, and the BDP has been approved, the component commanders of the joint command in-country translate the base development requirements into program budget requests and forward them through dual channels for validation and funding action. The dual channel consists of the command channel and Service component channel in which the command channel validates the budget request with the Service channel providing input at each level as required to the Military Departments preparing the final budget request for submission to the Secretary of Defense.

Programming and funding are closely allied to the base development planning and execution cycles, and are difficult to divorce from them. To assist in deriving a better understanding of the system, a proposed program and budgeting cycle for the validation and approval of base development budget requests is outlined below:

COMPONENT COMMANDERS - Submit base development budget requirements to the subordinate joint commander based on deployments approved

by the Secretary of Defense. An information copy is provided to the theater level component commanders.

JOINT SUBORDINATE COMMANDER - Reviews and comments to the theater commander on the component commanders' submissions. An information copy is provided to the theater level component commanders. These component commanders provide comments to the theater commander.

CINC (THEATER) - Reviews and comments to the JCS on the joint subordinate commander's program validation in light of the respective theater level component commanders' comments.

The theater level component commanders review and comment to their respective Military Departments on the theater commander's submissions in view of the theater commander's validation of the program. Information copies are provided to the theater commander.

JCS - After coordination with the Services, submits the validated program to the Secretary of Defense.

SERVICES - Prepare and submit their respective budget requests to DOD. Streamlined contingency procedures are used for Post-D-Day requests.

DOD - After review and necessary adjustment, the Secretary of Defense submits the validated program budget request to the Office of Management and Budget (OMB) and the President (after joint OSD/OMB hearings).

The OMB and the President submit the budget request to Congress for fund authorizations.

The submission of a base development program as outlined above results in the theater commanders having the requisite control over the

base development program and enables its integration into the plan to furnish needed construction and logistic support. To be fully responsive, the facility requirements should be in a format readily adaptable to a joint automatic data processing system (JADPS).

The initial program submission to Congress should be prepared well in advance of hostilities; it requests lump sum authority and funds for —

1. Advance procurement of materials and equipment. This allows for prestockage of functional components to support at least the lodgment phase of execution, plus those long lead time materials needed for the consolidation and operations phases. It should also allow for rotating of stocks to prevent obsolescence.

2. Mobilization/demobilization of construction capability. This should include funding for call-up or activation of additional military or civilian construction organizations.

3. Maintaining a level of construction capability over a specified time, at least until the follow-up funding occurs.

4. Acquisition of real estate at least for the lodgment phase.

MAP and AID programs are reviewed, monitored and coordinated to determine projects that will support contingency operations.

Follow-on programs adjust the construction capability which reflects in-country construction requirements in accordance with situation assessments and guidance from the theater commander. Follow-on programs are validated through the joint chain of command and budgeted for by the Services. They define the level of construction capability consistent with gross facility requirements and include funds —

1. To maintain the construction capability.

2. To provide for contingencies, such as repair and replacement of facilities due to enemy action.

3. To reimburse the Military Departments for other funds used.

Although the contingency programming system for initial and follow-on programs will be used in most instances, there may be occasions, both before and during contingency operations, when a Service Secretary will submit requests to the Secretary of Defense in advance of and without regard to validation through the joint channel. Following each submission, the Service concerned forwards an information copy to the JCS.

Contingency funds held by the Secretary of Defense are required to permit expansion of construction capability between funding cycles. These funds are released to meet accelerated or unplanned construction requirements that cannot be deferred. In addition to increasing the capability, contingency funds may be used to provide relief if follow-on funding programs are delayed. Thus, a contingency fund sustains the level of construction consistent with the current construction execution plan for the budget period. The contingency fund should be a minimum of 20 percent of each funding increment. Requests to the Secretary of Defense for release of contingency funds are staffed the same as initial and follow-on requests.

In addition to funds required to support in-country construction, out-of-theater support requirements such as training facilities, hospitals, and staging areas are included as follow-on programs. When determined critical to contingency support, these requirements are included in the budget for funding under the initial program.

Each Service component of the operational area command is responsible for furnishing input programming information on those facilities needed primarily to support its contingency operations. The joint commander in the operational area assigns responsibility for providing input for the programed facilities to be used jointly by Service components to the Service having primary interest. The designated DOD construction agent for the area provides each Service component with an estimate of the initial cost of contractor mobilization/demobilization and other items needed in direct support of the contractor effort.

THE EXECUTION SYSTEM

The base development execution process recommended increases the authority of the joint commanders and strengthens their directive authority. It provides greater flexibility for construction in the theater of operations. As with the planning/programming systems, the flow and extent of authority is clearly defined, and decision making points in the flow patterns are established. The base development execution system visualized by the writer, in chronological sequence, is as follows:

DOD - After the decision to execute an operation is made by the President, gives specific direction to the JCS, to include guidance needed to define the limitations and the level of effort needed.

JCS - Coordinate actions of the Services and joint commands to implement the most appropriate OPLAN. Next, the JCS evaluate the situation and review, modify and validate existing requirements as needed. They then direct the CINC concerned to execute the OPLAN, with

changes as appropriate. The JCS coordinates modifications of the pre-prepared Service budgets for the critical initial funding package necessary to sustain base development. They allocate and reallocate resources from other theaters to support the OPLAN. Also, the JCS determines what degree of mobilization is desirable, and advises DOD of the organizations needed immediately, both military and civilian.

SERVICES - In coordination with the JCS, submit the pre-prepared funding requirements based on the appropriate BDP, and defend the initial post-hostilities funding program package before Congress. Also, they initiate personnel actions to provide additional forces in support of the contingency, and to augment BDP staffs at component, subordinate joint commands and unified/specified command levels, plus the DOD construction agency staff in the TO, as desirable. Further, a construction directorate organization will be staffed in the TO as needed.

Existing Service materiel resources are made available to the theater as directed by the JCS. War reserve stocks are released, and construction resources are marshaled.

CINC (THEATER) - On order from the JCS, executes the OPLAN and activates a construction directorate as appropriate. After reviewing the BDP for adequacy and adjusting it as directed by JCS, and within his capabilities as needed, the theater commander then tasks a subordinate commander for implementation. The subordinate commander may be a joint force, or a uni-service commander whose interest in the area of operations is exclusive or predominant.

SUBORDINATE COMMANDER - Uses his base development planning staff to supervise the implementation of the Lodgment phase of the BDP; asks for additional staff augmentation as appropriate. The commander orders the execution of the approved OPLAN and supporting BDP. The BDP staff reviews the Lodgment phase of the BDP and makes alterations as needed; emphasis is also placed on initiating critical area damage control operations. The staff also begins work on preparation of more detailed plans for the Consolidation and Operations phases, to include preparation of draft programming documents. At this time, general roll-up planning is also begun. Construction progress is monitored and in-being resources are adjusted to support the situation. The BDP staff issues planning directives and guidance to insure smooth functioning of the construction program. Pains are taken to insure that each major Service element has some organic troop construction capability. The staff also inspects and closely monitors construction practices in the field to insure high-quality work, efficiency and effectiveness, and compliance with directives. Staff inspections are primarily concerned with:

1. Adherence to priorities.
2. Construction of minimum essential facilities.
3. Adherence to joint standards, planning factors and use of joint functional components (JCCS) to the maximum extent feasible.
4. Enforcement of high standards of professionalism among the construction forces, including those with primarily a maintenance mission.
5. Resolution of major problem areas, with emphasis on logistics bottlenecks.

6. Determination of new requirements or adjustments of existing priorities based on field conditions.

7. Realignment of the troop/contractor mix or repositioning of construction organizations based on the situation.

8. Use of local labor and materials to the utmost consistent with other policies.

9. Need for special or unusual construction requirements, such as a TURNKEY contract.

The BDP staff monitors and controls all new construction in the theater of operations, regardless of funding sources, including U.S. funded construction done by the host country (using the Advisor Chain-of-Command), with the exception of operational support construction done by engineers organic to divisions and separate brigades. The BDP staff is supported by a joint ADP system (JADPS) to stay abreast of the situation, and to submit construction progress reports up the Joint Chain-of-Command in accordance with JCS Pub 6.

The joint command Service components and the DOD-designated construction agent conduct construction operations under the operational control of the joint commander. The construction agent operates within his component Service channels for contract management. His staff is jointly augmented as appropriate, and he utilizes JCCS designs to the maximum, thereby holding contractor A-E requirements to a minimum.

Normally, all contract construction will be accomplished by the DOD construction agent. However, other arrangements may be authorized by DOD when they can be shown to offer significant advantages. The DOD construction agent is fully responsive to any commander charged with a BD responsibility in the TO.

During all phases of base development the BDP staffs, in coordination with the logistics staffs, place emphasis on rapid resupply versus build-up, thereby reducing the requirements for logistic facilities.

In conducting their work, the BDP staffs make maximum use of the most modern techniques and equipment, such as the use of reconnaissance aircraft to gather engineer intelligence and assist in site selections, and the use of automated techniques to plan and schedule work, and make calculations.

DOD - On receipt of Congressional authorization and funding, the Secretary of Defense passes the Military Construction Program (MCP) to the subordinate joint commander via the Joint Chain-of-Command. At the same time, he releases funds and all other authorizations to the Services.

JCS - On receipt of the MCP from the Secretary of Defense, the JCS review the program and transmit it to the theater commander. The JCS also authorize the Services to release any new resources to the theater commander in accordance with the review of the updated BDP.

SERVICES - On receipt of authority and funds from the Secretary of Defense and the JCS, the Services:

1. Activate and/or procure those additional resources authorized by Congress to support the contingency. This includes such actions as activating, training and equipping new engineer units, calling-up Reserve engineers, advertising for construction contractors, processing materiel for the JCCS, and initiating construction outside the TO.

2. Allocate MCP funds to the in-theater DOD designated construction agent.

3. Release newly created resources (less funds) to the theater commander as directed by JCS.

4. Identify any shortfalls in the Congressional approved MCP, and begin any reclamas required.

CINC (THEATER) - Assigns new resources to his subordinate commanders charged with executing the construction program.

SUBORDINATE COMMANDER - Directs and controls construction agencies and resources through a Director of Construction or equivalent. The staff continually reviews, coordinates and validates new requirements. Based on regular reassessments, the need for follow-on funding and construction resources is determined, and if needed, is consolidated into a single program as done previously. This initiates the follow-on programs which are then recycled through the chain-of-command; all levels take actions similar to those for the initial funding package. The process is repeated until all requirements are satisfied. As the need for follow-up programs diminishes, roll-up planning is intensified.

SUMMARY

One author summarizes the shortcomings of our recent Asian construction activities as a lack of planning, a lack of firm guidance,

and a lack of forceful coordination. He also pinpoints much of the overcontrol from Washington to be an outgrowth of shortcomings in the field. The main elements of the problem he highlights are:

1. No prior planning.
2. No real construction standards.
3. No firm requirements from the field.
4. No central control in-country.
5. Non-use of functional component systems.
6. Excessive original design requirements.
7. Lack of a logistical pipeline.
8. Lack of prepositioned reserve materials.
9. Lack of troop construction capability in being.
10. Miscellaneous problems such as overcontrol and excessive reporting.[1]

The Joint Integrated Base Establishment System (JIBES) proposed (See Figure 12) marries procedures and processes involved in base development planning with programming and execution of construction. It provides a continuous flow of current data through use of a joint ADP system, upon which astute decisions can be based. The flow and extent of authority is clearly defined and decision making points in the system are identified. The process is continuous and recycling, starting with the initial issuance of BDP guidance at the National level. Thus the system insures that there is a regular flow of planning,

---

[1]Edward H. Marsh II (Capt., U.S.N.), "Advanced Base Planning", Thesis, Industrial College of the Armed Forces: Washington, D.C., June 21, 1969, p. 34.

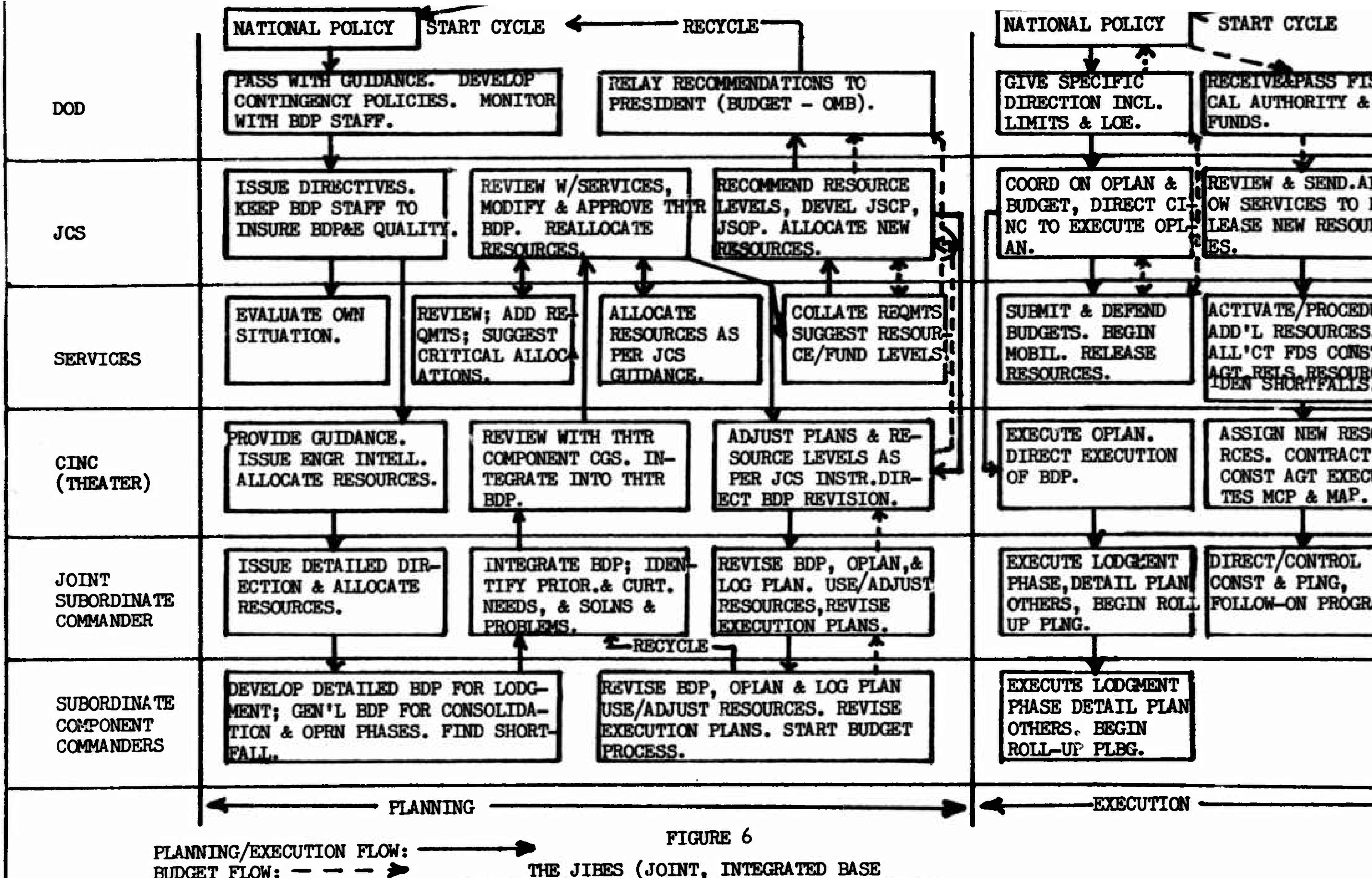


FIGURE 6

THE JIBES (JOINT, INTEGRATED BASE ESTABLISHMENT) SYSTEM (SIMPLIFIED FLOW CHART)

coordination and guidance. The system delegates authority along with responsibility down to joint subordinate and component commanders, which should minimize the control to be exercised by agencies in Washington, D.C.

The system utilizes a continuous, realistic planning procedure with emphasis on detailed planning for the first six months of an operation and general planning for the remainder, leaving the detailed planning of the Consolidation and Operations phases to in-theater BDP planners, after the initiation of the OPLAN. This should insure up-to-date availability of firm, accurate requirements from the field. The system calls for prestockage of joint functional components (JCCS) to support the Lodgment phase, plus critical long lead time items for the follow-on execution phases. Strict use of the JCCS insures prompt and complete compliance by all Services with in-theater standards, as these are built into the system. It also reduces the need for original design to a minimum. The integrated system calls for pre-hostilities identification of construction force requirements and provides for sufficient forces in-being to execute the Lodgment phase of the construction program. Requirements for additional military or civilian organizations for the later construction phases are identified early, and arrangements are made prior to OPLAN execution for training and mobilizing these forces. Construction forces to be used in the Lodgment phase are also highly trained for specific missions in the TO prior to OPLAN implementation. The JIBES system further provides for early identification of transportation needs and the provision and allocation of transportation resources to support at least the Lodgment phase of the construction program, thus insuring an immediately responsive logistical pipeline.

Also, the system provides for early establishment of a strong construction czar in the theater of operations, in the form of a construction director or equivalent, with broad powers over essentially all new construction, regardless of funding source. This should almost guarantee strong, centralized and knowledgeable direction of the construction program. If advisors are also working with the host country on a MAP Program, or assisting host country construction units involved in U.S. funded construction, they will be under the operational command of the construction director. Finally, the JIBES provides for reduction of the reporting and routine calculation burden, and enhances the chances for rapid action and reaction to OPLAN requirements by all levels, through the use of a JADPS.

If energetic, capable people, willing to make JIBES work, are inserted into the system, there is no reason why it should not substantially improve this Nation's ability to plan, program, and execute base development in support of OPLANS.

Chapter V

RECAPITULATION AND FINDINGS

This chapter will consist of a resume of the problems, current state of the art, and the analysis. Conclusions will be reached, and recommendations made for improvement and for further study.

THE RESUME

In light of recent experiences, construction seems to be playing an increasingly important role in the conduct of contingency operations overseas. This role tends to be decreased by the latest logistical advantages, such as the development of Roll-on/Roll-off and containerized shipping, and of huge aircraft like the C5-A. However, construction in a theater is made more difficult because of increased requirements for sophisticated construction due to advances in technology and standards of living, and by the seeming increased impatience of the American people with protracted contingency operations that have a debilitating effect on the national unity, will and resources, and appear to fall short of attaining worthwhile goals.

Thus, it is contingent upon the military planner to find workable solutions for ending a conflict quickly, yet efficiently and economically. The "graduated response" mode of operation has proven to be rather futile.

That the United States must be prepared to fight limited engagements around the globe is evident from a hasty perusal of the Nation's treaty obligations. With the exception of our NATO allies, the bulk of our allies are concentrated in Asia, the Pacific and South America and can generally be regarded as underdeveloped, newly emerging nations. In addition, the United States has interests in other parts of the world, such as the Middle East, where it is not bound by a formal treaty, but is pledged to cooperate in mutual defense with other allies interested in the area.

Official policy not withstanding, it appears naive to believe that after our conflict in South Vietnam, there will be no more wars. In an address to the American Society of Newspaper Editors on May 18, 1966, Secretary McNamara stated:

> In the last eight years alone there have been no less than 164 internationally significant outbreaks of violence . . . each of them specifically designed as a serious challenge to the authority, or the very existence, of the government in question.[1]

And that was before the six day Arab-Israeli War, the Sino-Soviet border disputes, and the U.S. incursions into Cambodia and Laos, just to mention a few! Clearly, the trend of such conflicts is remaining at least constant, and with the U.S. policy of continued, though reduced, assistance to our allies, there appears to be a distinct probability of U.S. involvement in some future conflict. There has been a direct relationship of many of the most recent conflicts to economic weakness and backwardness. This leads to the inescapable conclusion that the

---

[1]Robert McNamara (Secretary of Defense), Address to American Society of Newspaper Editors, New York Times, May 19, 1966, p. 11.

developing nations, many of them our allies, provide the most fertile ground for future conflicts.

Will bases such as we know them in Asia be needed in future conflicts? The fact that some forward logistical and operational bases outside of CONUS will be essential is incontrovertable. The size and complexity of such bases is a factor of the size and complexity of the forces in the area, the level of stockage within the theater, the intensity of conflict, and the methods of resupply used. The pattern of subversion so prevalent in the World today leads unremittingly toward insurgency using the well advertised methods of Mao, Giap, and Che. Internal defense forces must be ready to meet and quickly defeat this type of enemy.

As one author says, "The employment dictated is parallel to the Indian campaigns in the western United States during the latter part of the 19th Century. Here cavalry units operated from fixed bases to strike the Indians in a conflict of mobility."[2] This is generally the system being used today in RVN and seems to establish a pattern for the future.

Clearly, the key to success for the base developer is speed and responsiveness. History has generally shown that the earlier an internal defense or stability force is committed, the smaller it need be.

---

[2]Joseph J. Rochefort, Jr. (Lt.Col., U.S.A.), "Base Development - Success or Failure", Student Essay , U.S. Army War College: Carlisle Barracks, Pennsylvania, January 13, 1967, p. 7.

What then should be learned from our recent U.S. base development experiences to enhance responsiveness? How can the base development job be done better? In reviewing base development in Asia from 1965 through 1969, it is evident that the undeveloped nature of the areas, particularly Southeast Asia, placed a premimum on rapid construction as a prerequisite to effective military operations and support of the deployed forces. The "cavalry outpost" nature of the Vietnam Conflict and its long duration caused the evolution of a much higher standard and quality of construction than was evident in previous wars.

In Thailand and Korea, both in a "cold war" situation, extensive use was made of contractors to do contingency type construction, and in RVN for the first time a high degree of reliance was placed on civilian construction in a war zone. Because of the need to respond rapidly to demands for construction not foreseen in planning and the constraints imposed by the limited number of engineer troop construction forces on active duty and the decision not to mobilize significant reserves, mobilization of a sizable civilian construction force proved imperative. Throughout the RVN base development period, contractor forces made a sizable contribution, although they were gradually reduced as more troops became available.

In RVN, the "graduated response" strategy and dynamic nature of the conflict added to the usual difficulty of projecting requirements, the overall contractor capabilities provided were adequate but not always timely or in ideal balance with the actual requirements as they evolved. There were agonizing delays in gaining approval and developing the military construction capabilities desperately needed to support combat operations throughout Vietnam.

The total capabilities of both troop and contractor forces in RVN were generally effectively employed. Initially, the contractor forces dominated, but by the end of 1968, the engineer construction troops outnumbered contractor forces two to one. In addition to these primary construction forces, there were many other construction forces available, such as TURNKEY contractors used for special projects, facilities maintenance forces, self-help, and local contracting authority; these resources made a substantial contribution to the construction program.

During the early stages of base development in Thailand, RVN and Korea, engineer staffs were inadequately manned for prompt development of plans and to perform the required coordination and inspection of activities. The problem was solved in Korea by temporary augmentation of the existing staff; in Thailand manning levels were belatedly increased. In RVN, the inadequacy of the staffs was particularly critical during the initial stages of the buildup since BDP and the management of scarce resources called for extraordinary engineer effort. One result of this situation was the creation of a Construction Directorate responsible to COMUSMACV.

The expansion of the construction program complicated real estate acquisition in both Thailand and Vietnam. Cumbersome systems had evolved for approval; because of this construction was impeded in many instances by delays in real estate acquisition.

Difficulties in early planning deterred the accurate forecasting of construction materials during the period that the supply pipeline was being established in RVN. This caused the Services to ship on "best

estimates", balanced in accordance with the proportions outlined in the various functional component systems. Although this method filled the pipeline, it also created imbalances and tended to dictate priorities on the basis of what was available rather than what was needed. These deficiencies declined as the situation stabilized.

Initially in RVN, there was a shortage of heavy construction equipment to expand the contractor's capability, to fully equip Army engineer units, and to supply the facilities maintenance contractor. The lack of reserve stocks of equipment necessitated large-scale procurements of available commercial equipment with a resultant proliferation of makes and models, causing considerable problems, the most important being a lack of spare parts.

In Vietnam the functional components of the Services greatly assisted the early planning of facilities, and to some extent their construction. However, there were insufficient materials in the War Reserve stocks to substantially aid the total construction effort. In Thailand and Korea, little use was made of Service functional component systems, although in Korea off-the-shelf prefabricated, pre-engineered, modular structures were used extensively by the Army and Air Force in the buildup.

In RVN, low early priorities and critical shortages in dredges; pile drivers; and prefabricated, portable piers caused long delays in building the required ports.

Programming and funding of construction in RVN caused a continuing dichotomy between those desiring control of each line item from

Washington, D.C. and those desiring complete flexibility at the theater level. The resulting compromises caused considerable "wheel-spinning" at all levels. Programming and funding of construction was essentially accomplished using the peacetime evolved in-being system, which provided maximum visibility and minimum flexibility. When applied to the RVN contingency, it resulted in excessive reprogramming, re-evaluation, rejustification, and resubmission. However, when the program finally reached Congress, it was responsive. For example, less than four days were needed to approve the FY 65 S appropriation. Unfortunately, the fund requests of the early programs did not fully reflect the stated needs of the responsible commanders.

One of the major problem areas associated with the management aspects of construction in RVN concerned the need to have all funds available prior to the start of work (full-funding concept). This concept was unduly restrictive for a TO. It ignored the scope of the contractor mobilization in early 1966 and the unallocated portions of funds appropriated by Congress, and saw the construction resources of the component commanders and the OICC, RVN separately rather than interrelated parts of a master program. This caused the deferral, reduction, or cancellation of many projects, with detrimental effects on both effectiveness and responsiveness of construction.

Detailed reporting systems were developed for RVN which required considerable management effort to prepare and analyze; the value of many of these reports appears questionable.

Many critical facilities in RVN were not constructed when needed. However, overall, the construction programs in Thailand, Vietnam and

Korea met the essential test of being responsive to the needs of the component and joint commanders.

One item stands out from an analysis of base development in the mid-to-late sixties, that is, construction must get the jump on other operational efforts, or it will be almost impossible to catch-up.

What has been done to alleviate the problem?

Numerous investigations and studies have been conducted on BDP&E, and various recommendations have been made. The desirability of having a director of construction early in the construction cycle has been recognized. The JCS initiated a number of actions which have culminated in increased base development interest at all levels. Notable among JCS actions has been the establishment of a Joint Construction Board for Contingency Operations; although this Board has great potential, little has been realized thus far. The JCS has also standardized the base development format and certain joint base development procedures under Change 2, JCS Pub. 3. However, it leaves numerous items, such as construction standards, planning factors and criteria to the discretion of the theater commanders. The Joint Logistics Review Board findings should have an important bearing on future base development operations, but these are currently under examination at the National level, and it is impossible to access the Board's specific impact. In the area of doctrine, DOD has published general guidance, but it is too broad in its overview, and invites the same problems that plaqued RVN. It leaves development of standards to the theater commanders; the planning cycle is put into the hands of the field commanders. In

Chapter 6, the DOD manual indicates that prepackaged, pre-engineered components should be used to the maximum and cites the advantages of their use. However, no recognition is made of the desirability of having a joint functional components system, which gives all the Services essentially the same types of common facilities. It advises the military departments to prestock minimum essential initial requirements. However, it does not seem to realize that unless minimum essential requirements are stocked, they cannot be used, and when an OPLAN must be quickly implemented, chances are that regular construction materials, which are more easily obtainable, will then be used. This defeats the entire system. In short, the manual does not recognize that a total construction package, a true system, can be obtained by planned, enforced use of joint functional components in every phase of base development. To be more meaningful, DOD guidance should address the specific problems posed by knowledgeable commanders, the various study groups and other experts. It should address itself to the fact that joint functional components are cost effective; that pre-determined standards and planning factors are essential to hold down costs and maintain equity; that a number of components for use by all commands must be developed; that deviations from the system cannot be tolerated without urgent reasons; that field commanders should not be allowed to dictate standards and that central planning of standards and criteria is needed; that a functional component system must be in being, not just on paper; and that detailed planning and siting can best be done by the field commanders.

Army doctrine has just been revised and is in the process of being implemented shortly; the (test) designation will soon be dropped

from the manual. It has not waited for DOD/JCS guidance to show the way, but has incorporated most of the key recommendations of various high-level study groups.

Air Force and Navy doctrine has not been revised, probably due to the fact that their programs were considerably smaller than the Army's, and they (particularly the Air Force) experienced substantially less difficulty than the Army with base development. The Army has also taken recent measures to centralize its BDP operations within the Office of the Chief of Engineers. This is certainly a step in the right direction, but in the author's opinion, should be reinforced by a similar Joint board at JCS level.

In the areas of functional components and contingency designs, the Air Force and Navy revised their design manuals in early 1967 and 1966 respectively, but these revisions did not incorporate the latest industry advances in building construction, and came out too early to include the benefits of SEA and Korean experience.

Regarding functional components, the Air Force appears to have made the most dramatic breakthrough; its Bare Base Mobility concept seems speedy, functional and cost-effective in terms of construction forces, equipment and materials. In the author's opinion, it would be the best concept to use in support of combat forces during the Lodgment phase of an operation. The Navy's Advanced Base Functional Components System seems to have the most promise for the Consolidation and Operations phases, since it marries construction units, operating personnel, equipment and materials very effectively. In the writer's opinion,

however, before it can be used on a joint basis, it must be updated to incorporate service peculiar facilities and the most modern pre-engineered, prepackaged, modular, prefabricated functional components. The Army is in the process of modernizing its system conceptually, but has a long way to go before its supporting manuals, TM 5-301, TM 5-302 and TM 5-303, are updated. And, even further to go before any modern components are available for prestockage.

The Department of Defense, the Army and the Navy have all done extensive work on primary ADP systems to support base development planning and execution. All systems appear to be potentially useful and adaptable to a joint system, and it appears advantageous to conduct further work in this area. It seems that the best way to handle this would be to establish a joint ADP committee of qualified experts at JCS level to develop the joint ADP system, using the best features of all or concentrating on one of the existing systems. Another alternative is for DOD/JCS to designate one of the Services as the agent for development of a joint ADP system, but since all the Services and the joint commands are deeply involved in the resolution of this problem, the author favors the joint approach. Additional work also needs to be done on supporting ADP systems of joint interest.

A framework to serve as a starting point for development of a joint, integrated system for base development planning and execution has been proposed in this thesis which takes advantage of recently learned lessons regarding base development, and maximizes the use of the most modern technology available to the construction industry. It

is designed to eliminate the deficiencies encountered in RVN and elsewhere, and to reduce duplication of facilities and effort to a minimum.

CONCLUSIONS

Based on examination of the available data the following major conclusions are presented.

1. Due to its worldwide treaty commitments and continuing International tensions, particularly in the emerging nations, the United States will be involved in future contingency operations.

2. The prudent use of time will be more essential than ever in future contingency operations.

3. Contingency operations occurring in under-developed nations will tend to have a fixed enclave nature, thus maximizing requirements for large quantities of sophisticated construction relative to the combat forces employed. Therefore, if limited war is planned for all probable areas of operations, the construction requirements will be "worse-cased"; in event of an actual more mobile and dispersed general war, actual requirements in a specific area would tend to be less.

4. Considering the numerous deficiencies encountered in conducting base development operations in Thailand, Vietnam and Korea, the key recommendations of the Joint Logistic Review Board and the Special Military Construction Study Group (presented in Chapter III) which have not as yet been acted upon appear pertinent and worthy of implementation.

5. In light of the available data and the recommendation of the Special Military Construction Study Group, the proposed Joint Integrated Base Establishment System (JIBES) appears to dispose of most of the deficiencies apparent in recent contingencies, and offers a workable and improved concept for base development planning and execution which should serve as a starting point for further development and eventual implementation.

6. DOD guidance, along with JCS Pub 3, should be revised to incorporate the key recommendations of the Joint Logistics Review Board and the Special Military Construction Study Group. Once this is done, Service doctrine can be brought into line with DOD/JCS instructions.

7. To responsively support a system like the JIBES, development of a joint automated data processing system, preferably by a joint committee at JCS level, is essential.

8. To effectively and efficiently support a system like the JIBES, establishment of a Joint Contingency Construction System (JCCS) of functional components, preferably by a joint committee at JCS level, is critical. This system should initially be built around the Bare Base Mobility Concept for the Lodgment phase of construction, and the Advanced Base Functional Component System for succeeding phases. Much work is needed to incorporate the latest technology into prefabricated, pre-engineered, modular, relocatable facilities of all types, from buildings to airfields and ports.

9. To insure rapid initial responsiveness in a system like the JIBES, there is a crucial need for developing streamlined contingency

programming/funding and real estate procedures, and having supporting documents prepared prior to implementation of OPLANS.

10. Recent and continuing improvements in logistical concepts and equipment tend to reduce logistical requirements in a combat theater, but do not eliminate the need for forward depots, and increase the need for speed in construction and prestockage of War Reserve Materials.

11. To effectively monitor base development actions, establishment of adequate, well-trained staffs at all levels, particularly DOD/JCS, is imperative.

RECOMMENDATIONS

Considering the conclusions presented and the existing situation, the following actions are recommended.

1. Adoption and implementation by DOD/JCS of the key recommendations of the Joint Logistics Review Board and the Special Military Construction Study Group which have not as yet been acted upon.

2. Based on implementation of the above recommendations, revision of DOD/JCS and Service base development doctrine to incorporate the new concepts.

3. In consonance with the Special Military Construction Study Group's recommendations for development of a joint, integrated base development planning and execution system, establishment or designation of a joint group, responsive to the Construction Board for Contingency Operations, to develop, using the JIBES as a starting point, a system suitable for use by all the Services and DOD/JCS in base development planning and execution.

4. Establishment or designation of another joint group, also responsive to the Construction Board for Contingency Operations, to make a Joint Contingency Construction System (JCCS) operational.

5. Establishment or designation of yet another joint group under the Construction Board for Contingency Operations to develop streamlined programming/funding and real estate acquisition procedures, along with necessary supporting and implementing documents.

6. Procurement and prestockage of sufficient quantities of JCCS components to insure first-rate support of combat forces through the Lodgment phase, for the most probable contingencies. Also, assurance that the prestocks are exercised for training purposes, and rotated as needed.

7. Establishment of adequate base development staffs at all levels, particularly at DOD/JCS.

SELECTED

BIBLIOGRAPHY

Books

Campbell, William G., Form and Style in Thesis Writing, 3rd edition. Boston: Houghton Mifflin Co., 1969.

Esposito, Vincent J. (ed.). The West Point Atlas of American Wars. New York: Praeger, 1959.

Hillway, Tyrus. Introduction to Research, 2nd edition. Boston: Houghton Mifflin Co., 1956.

Janowitz, Morris. The Professional Soldier. New York: Macmillan Company, 1967.

Lie, Trygve. In the Cause of Peace. New York: Macmillan Company, 1954.

Schelling, Thomas C. Managing the Arms Race in National Security: Political, Military and Economic Strategies in the Decade Ahead. New York: Praeger, 1963.

Thucydides. The Peloponnesian War. Translated by Rex Warner. New York: Penquin Books, 1954.

Westover, John G. (Capt., U.S.A.). Combat Support in Korea, Washington: Combat Forces Press, 1955.

World Almanac and Book of Facts, The. New York: Newspaper Enterprises Association, 1967.

Public Documents

Armed Forces Staff College, Base Development for Joint Forces, AFSC Publication 6: Norfolk, Virginia, August 1966.

Coll, Blanche D., Keith and Rosenthal. United States Army in World War II, the Technical Services, the Corps of Engineers: Troops and Equipment. Washington: U.S. Government Printing Office, 1958.

Comptroller General of the United States. Problems in the Administration of the Mi tary Building Program in Thailand. Report to Congress. General Ac ounting Office: Washington, D.C., June 12, 1969.

_______. United States Construction Activities in the Republic of Vietnam, 1965-1966. Report to Congress. General Accounting Office: Washington, D.C., May 1967.

_______. U.S. Construction Activities in Thailand, 1966 and 1967. Report to Congress. General Accounting Office: Washington, D.C., November 13, 1968.

Dod, Karl C. United States Army in World War II, The Corps of Engineers: The War Against Japan. Washington: U.S. Government Printing Office, 1966.

Ruppenthal, Roland G. United States Army in World War II, Logistic Support of the Armies, Volume I, May 1941-September 1944. Washington, D.C.: U.S. Government Printing Office, 1953.

U.S. Army Command and General Staff College. Current and Future Combat, Combat Support, and Combat Service Support Systems, Subj. R5620. Fort Leavenworth, Ks.: U.S. Army Command and General Staff College [Academic Year 1970-71].

U.S. Congress, House of Representatives, Committee on Armed Services. Report of Special Subcommittee Following Visit to Southeast Asia. Washington, D.C.: U.S. Government Printing Office, May 6, 1967.

_______. House of Representatives, Subcommittees of the Committee on Appropriations. Supplemental Defense Appropriations for 1966. Testimony of Maj. Gen. W. R. Shuler, Director of Installations, Deputy Chief of Staff for Logistics, U.S. Army, 1966.

U.S. Congressional Record, 77th Cong., 1st Sess., December 1941, CLXXXVII, No. 219.

_______. 87th Cong., 1st Sess., June, 1961, CVII, No. 94.

_______. 88th Cong., 2d Sess., August, 1964, CX, No. 153.

_______. 90th Cong., 1st Sess., 1967, CXIII, Pt. 71.

U.S. Department of Defense. Base Development for Contingency Operations. Manual, Office of the Deputy Assistant Secretary of Defense for Properties and Installations: Washington, D.C., December, 1968.

_______. Command History (U), Annex A. Commander in Chief, Pacific, 1965.

________. Command History 1964 (U). Saigon, Vietnam: U.S. Military Assistance Command, Vietnam, n.d. (TOP SECRET).

________. Construction Directives, Construction Bulletin 415-2-2. Military Assistance Command, Vietnam: March 28, 1966.

________. Logistic Support in the Vietnam Era: Monograph 6, Construction. A Report by the Joint Logistics Review Board: Washington, D.C., October 19, 1970. Contains a very fine and detailed Bibliography for Base Development Information - twenty pages.

________. Military Construction Status Report for South Vietnam. Military Assistance Command, Vietnam: Saigon, Vietnam, February 28, 1969.

________. Operations and Maintenance Facilities Program — Minor Construction Programming, Review and Reporting Procedures, Directive 4270.24. Washington, D.C.: U.S. Government Printing Office, June 30, 1961.

________. Responsibilities for Military Troop Construction Support of the Department of the Air Force Overseas. Directive 1315.6, Washington, D.C.: U.S. Government Printing Office, February 5, 1967.

U.S. Department of the Air Force. Planning and Design of Theater of Operation Air Bases, AFM 86-3. Washington, D.C.: U.S. Government Printing Office, January 20, 1967.

U.S. Department of the Army. American Military History, 1607-1958, ROTCM 145-20. Washington: U.S. Government Printing Office, 1959.

________. Base Development, FM 31-82 (Test). Washington, D.C.: U.S. Government Printing Office, February 1971.

________. Base Development Planning Guide. Engineer Strategic Studies Group, Office, Chief of Engineers: Washington, D.C., October 1967.

________. Boards, Commissions, and Committees, "Army Base Development Board", Regulation No. 15-24, Office of the Chief of Staff: Washington, D.C., October 14, 1970.

________. Dictionary of United States Army Terms, AR 320-5. Washington, D.C.: U.S. Government Printing Office, 1966.

________. Military Engineering in Support of U.S. Army 1967-1975 (U). A Report by the U.S. Army Military Engineering Study Group, Vol II, Part 2, Washington, D.C., February 1968.

________. Department of the Air Force. Troop Construction for the Air Force, AR 415-30; AFR 88-12. Washington, D.C.: U.S. Government Printing Office, July 28, 1965.

U.S. Department of the Navy. Analysis of Construction Capability Required in Vietnam (U). Naval Facilities Engineering Command: Washington, D.C., March 15, 1966 (CONFIDENTIAL).

________. Base Development, Publication NWIP 11-23 (A). Office of the Chief of Naval Operations: Washington, D.C., April 6, 1967.

________. Building the Navy's Bases in World War II, Vol. 1, Washington, D.C.: U.S. Government Printing Office, n.d.

________. Engineers' Handbook for Planning Navy Advanced Bases, BUDOCKSINST 04040.4A: Washington, D.C., December 9, 1957.

________. Facility Planning Factors for Naval Shore Activities, NAVFAC P-80, Naval Facilities Engineering Command: Washington, D.C., January 1967.

________. History of SEA Construction Program. Naval Facilities Engineering Command: Washington, D.C., September 7, 1965.

U.S., Joint Chiefs of Staff, Report by the Special Military Construction Study Group (U). (Special Military Construction Study Group), Washington, D.C.: July 17, 1968 (SECRET).

Westmoreland, W.C. (Gen., U.S.A.) and Sharp, U.S.G. (Adm.,U.S.N.). Report on the War in Vietnam, Washington, D.C.: U.S. Government Printing Office, June 30, 1968.

Articles & Periodicals

"A Major U.S. Bastion Springs Up in Thailand", Business Week, No. 1967 (May 13, 1967), 38-39.

Besson, Frank S. Jr. (Gen., U.S.A.). "Logistics Keeps the Army Rolling in Vietnam", TRANSLOG (formerly Transportation Proceedings), (April 1967), 2-6.

"C-5A, New Era in Mobility", Army Logistician, 2, No. 5 (September-October 1970), 12-13.

Cassidy, William F. (Lt. Gen., U.S.A.) "The Army's Engineers in Vietnam: A Record Unsurpassed", Army, 17, No. 10 (October 1967), 61-72.

"Containerization Program Wins Product Management Status", Army Logistician, Vol. 3, No. 1 (January-February 1971), 15.

"DA Base Development Board". Army Logistician, 3, No. 1 (January-February 1971), 37-38.

Edelson, Bruce H. (Lieut. Comdr., U.S.N.). "Navy OICC Thailand Administers Kanchanaburi Project", The Navy Civil Engineer Magazine, 10, No. 2 (February 1968), 10-14.

Eifler, Charles W. (Maj. Gen., U.S.A.). "Management by Conflict", Army (March 1968), 64-65.

"Essayons!", Time Magazine, 87, No. 6 (February 11, 1966), 25.

"Getting There Fast With the Most", Army Digest, 23, No. 1 (January 1968), 64.

"Give as You Never Gave", Newsweek, LXIX, No. 24 (June 19, 1967), 35-36.

Haight, William P. (Maj., U.S.M.C.). "Instant Airfields Ashore", U.S. Naval Institute Proceedings (November 1968), 168.

Hoefling, John A. (Col., U.S.A.). "The Army and the Elusive FDL", Army, 18, No. 6 (June 1968), 48-56.

Johnson, H.J. (Rear Adm., U.S.N.). "Management of War Zone Construction", Defense Management Journal, 5, No. 3 (Summer 1969), 44-47.

Johnson, Lyndon B. (President) National Television Address, March 31, 1968, New York Times, April 1, 1968.

________. Address to the National Association of Broadcasters, Chicago, April 1, 1968, Kansas City Times, April 2, 1968.

"Joint Logistics Review Board, The" Army Logistician, 2, No. 4 (July-August 1970), 8-11.

"Joint Logistics Review Board Findings, The" Army Logistician, 2, No. 6 (November-December 1970), 10-13.

Land, C.S. "Logistics Buildup in Vietnam Aided by 'Instant Piers' and U.S. Construction Combine", Navy, 11, No. 3 (March 1968).

Lincoln, L. J. (Brig. Gen., U.S.A.). "Construction in a Cold War Theater of Operations", Army Information Digest, 13, No. 7 (July 1958), 11-14.

McNamara, Robert (Secretary of Defense). Address to the American Society of Newspaper Editors, New York Times, May 19, 1966.

Mecklin, John. "Building by the Billions in Vietnam", Fortune, LXXIV, No. 4 (September 1966), 113-117, 198, 203-204, 206-207.

Morris, Thomas D. "Upgrading the Effectiveness of Logistics Systems", Defense Management Journal, III, No. 4 (Fall 1967), 11.

"Nation, The" Time Magazine, LXXXIX, No. 24 (June 16, 1967), 15-21.

"National Affairs", Time Magazine, LXIV, No. 18 (November 3, 1952), 19-28.

"Pullout From Vietnam: It's Still Scheduled", U.S. News & World Report, LVI, No. 9 (March 2, 1964), 7.

Raymond, Daniel A. (Brig. Gen., U.S.A.). "A Brick and Mortar View of — Construction in South Vietnam", Defense Management Journal, III, No. 4 (Fall 1967), 17.

Shoemaker, Robert M. (Lt. Col., U.S.A.). "Air Supported Strategic Army Corps", Military Review, XLVIII, No. 11 (November 1967), 20-30.

"Significant Rumblings", Newsweek, LXV, No. 3 (January 18, 1965), 33-34.

Strong, Paschel N. (Col., U.S.A.). "Engineers in Korea - Operation 'Shoestring'". The Military Engineer, XLIII, No. 291 (January - February 1951), 11-14.

Sturgis, Samuel D., Jr. (Lt. Gen., U.S.A.). "Construction Power is Combat Power", Army, 6, No. 9 (April, 1956), 14-17, 50-54.

"War in Asia", Time Magazine, LVI, No. 2 (July 10, 1950), 7-17.

Reports

"An Evaluation of Airborne Sensors for Site Selector Engineering Data Requirements", Kirkland Air Force Base, New Mexico: Texas Instruments, Inc., Sandia Laboratories and the University of New Mexico, April 1970.

"Environmental Analysis Relative to Portable Port Operations", Port Hueneme, Calif.: Ocean Service and Engineering Inc., November 21, 1969.

Goldstein, J. R. The History, Operations, and Goals of a Non-profit Corporation, P. 22 36-1, Santa Monica, Calif.: The Rand Corporation, April 1961.

Goodyear Aerospace Corporation. "Modular and Expandable Shelters for Global Mobility", Brochure, Goodyear Aerospace Corporation: Akron, Ohio, January 10, 1971.

National Military Command System Support Center. "Gross Feasibility Estimator Model (GFE-111)", TM 57-70. Technical Memorandum: Cameron Station, Alexandria, Virginia, August 1970.

Rand Corporation, The. "Estimating the Cost of Relocating Military Bases", Technical Report: Los Angeles, Calif., May 1969.

LTV Aerospace Corporation. "Rapid Site Preparation Techniques for VTOL Aircraft", Parts II and III: Wright-Patterson Air Force Base, Ohio, November 1968 and July 1969.

Research Analysis Corporation. "ETNAM I (European Theater Network Analysis Model I)", Study: McLean, Virginia, August 1969.

Research Analysis Corporation. "Simulation and Gaming Methods for Analysis of Logistics (SIGMALOG): Theater Construction Model", RAC-TP-389. Technical Paper: McLean, Virginia, May 1970.

Union Carbide Corporation. "A Branch-Bound Algorithm for the Capacitated Facilities Location Problem", Technical Report, n.d.

U.S. Department of the Air Force. "Project 3782. "Bare Base Mobility", Brochure, Aeronautical Systems Division (AFSC): Wright-Patterson Air Force Base, January 10, 1971.

Unpublished Material

Blackburn (Vice Adm., U.S.N.), Commander, Seventh Fleet (1965). Written Comments to Vice Adm. Hooper, April 1969.

Cannon, M. C. (Lt. Col., U.S.A.). "Base Development for Contingency Operations, A Doctrinal Study", Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1968.

Chandler, John P. (Col., U.S.A.). <u>The Engineer Strategic Studies Group</u>. Paper, Engineer Strategic Studies Group: Washington, D. C., December 17, 1970.

Duke, C. M. (Brig. Gen., U.S.A.). "Review of Construction Activities, RVN". Memorandum with Inclosure, for Brig. Gen. Raymond, Director of Construction, MACV, APO San Francisco 96491, n.d.

Eifler (Maj. Gen., U.S.A.). <u>Debriefing Report</u>. 1st Logistical Command: Long Binh, Vietnam, August 1967.

Galloway, G. E. (Maj., U.S.A.). "Historical Study of United States Army Engineer Operations in the Republic of Vietnam. January 1965 - November 1967, A". Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1968.

Geesey, Edwin P. (Lt. Col., U.S.A.). "Base Development Forces for Low Intensity Conflict". Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1969.

Goodson, Allen M. (Lt. Col., U.S.A.). "Impact of the U.S. Military Construction Program on the Thai Economy". Thesis, Industrial College of the Armed Forces: Washington, D. C., March 1969.

Gunter, Gurnie C. (Maj., U.S.A.). "Automated Data Processing for Selecting Final Alignments of Roads and Airfields and Scheduling and Controlling Road and Airfield Construction". Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1967.

Hartman, Donald F. (Maj., U.S.A.). "Construction Planning in the Theater of Operations". Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1968.

King, H. T., (Capt., U.S.N.). Comments Relating to Logistic Support in Vietnam, Late 1965 - Spring 1967, NAV SUPPACT, Saigon. Memorandum for Record, Naval Support Activity: Saigon, Vietnam, n.d.

Lynch, James E. (Lt. Col., U.S.A.). "Base Development Planning". Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, December 2, 1968.

_______. "Buildings in Boxes". Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, March 3, 1969.

Marsh, Edward H., II (Capt.,U.S.N.). "Advanced Base Planning". Thesis, Industrial College of the Armed Forces: Washington, D.C., June 21, 1969.

O'Shei, D. M. (Maj., U.S.A.). "Recommendations for Initiation and Administration of Troop Construction in the Limited War Theater of Operations". Thesis, U.S. Army Command and General Staff College: Fort Leavenworth, Kansas, 1968.

Planning Research Corporation. "New Construction Module Analysis and Design for the Integrated Facilities System". Vol. IV: Washington, D. C., December, 1969.

Quigley, Donovan B. (Comdr., U.S.N.). "Impact of Construction Sponsored by the United States on the Economy of Thailand, The". Thesis, Industrial College of the Armed Forces: Washington, D. C., March 1969.

Raymond, Daniel A. (Brig. Gen., U.S.A.). "Observations on the Construction Program, RVN, 1 October 1965 - 1 June 1967 (U)". Saigon, Vietnam: Military Assistance Command, 1967, (CONFIDENTIAL).

Research Analysis Corporation. "Prescore Program for Estimating Construction Requirements". Manuscript: McLean, Virginia, April 1968.

_______. "SIGMALOG", Pamphlet: McLean, Virginia, n.d.

Revie, Richard D. (Maj., U.S.M.C.). "Modular Construction Concept for Marine Corps Advanced Base Development in Counterinsurgency Operations," Thesis, Air University: Maxwell Air Force Base, June 1967.

Rochefort, Joseph J. Jr. (Lt. Col., U.S.A.). "Base Development - Success or Failure". Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, January 13, 1967.

________. "Overseas Bases - Keystone of Strategic Mobility". Student Essay, U.S. Army War College: Carlisle Barracks, Pennsylvania, April 7, 1967.

Shircliff, Robert G. (Col., U.S.A.). "More Push - Less Pull". Student Thesis, U.S. Army War College: Carlisle Barracks, Pennsylvania, April 25, 1968.

U.S. Army, XVIII Airborne Corps. "The Stability Operation in the Dominican Republic, Military Engineering Considerations, Activities, and Evaluations". Office of the Engineer, Fort Bragg, North Carolina, February 11, 1966.

U.S. Department of Defense. <u>Advance Procurement of Construction Materials and Construction in South Vietnam (U)</u>. Memorandum, Secretary of Defense: Washington, D. C., September 22, 1965 (SECRET).

________. <u>Base Development</u>. Custom Bibliography, Defense Logistics Studies Information Exchange, U.S. Army Logistics Management Center: Fort Lee, Virginia, October 6, 1970. Contains a very fine list of abstracts of works concerning base development.

________. <u>Command Manual for Construction Programs South Vietnam (COPSOV)</u>. U.S. Military Assistance Command, Vietnam: Saigon, Vietnam, July 15, 1969.

________. <u>Design and Construction Standards for Facilities in Vietnam Under the Military Construction Program.</u> Memorandum, Office of the Assistant Secretary of Defense (Projects and Installations): Washington, D.C., February 8, 1965.

________. <u>Financing of Long Leadtime Construction Supplies and Materials in Vietnam (U)</u>. Memorandum, Secretary of Defense: Washington, D.C., January 8, 1966 (CONFIDENTIAL).

________. <u>Funding of Construction Cost of U.S. Buildup in Vietnam</u> (U). Memorandum, Secretary of Defense: Washington, D. C., September 12, 1964 (SECRET).

________. <u>Real Property Maintenance Council Meeting</u>. Memorandum for Record, Enclosure 1, Office of the Secretary of Defense: Washington, D. C., January 31, 1968.

________. Memorandum for Record, Enclosure 3, Office of the Secretary of Defense: Washington, D. C., June 28, 1966.

________. RVN Construction Requirements (U). Message 278950Z, Commander, U.S. Military Assistance Command, Vietnam: Saigon, Vietnam, February 27, 1966 (CONFIDENTIAL).

U.S. Department of the Army. Army Facilities Component System (AFCS), AR 415-16 (DRAFT). Office of the Chief of Engineers: Washington, D. C., n.d.

________. Base Development, EAR 405-2. Eighth U.S. Army: Seoul, Korea, April 24, 1968.

________. Base Development Planning. Letter, Eighth U.S. Army: Seoul, Korea, April 20, 1968.

________. Some Implications of Social/Economic/Technological Forecasting to Military Construction. Working Paper, TR 68-012, Office of the Chief of Engineers: Washington, D.C., July 1, 1968.

Historical Review, Colonel Robert Duke, U.S.A., Commanding Officer, 1st Logistical Command, United States Army, Vietnam: Saigon, January 3, 1966.

Modern Base Development Facilities Components. Letter, AMCRP-G, U.S. Army Materiel Command: Washington, D.C., March 4, 1970.

Operational Report of the 44th Engineer Group (Construction for the Period Ending 31 October 1968). RCS-CSFOR-65(RI) WA93AA: Thailand, November 15, 1968.

World War II Construction by U.S. Army Corps of Engineers. Office, Chief of Engineers, Fact Sheet, ENGEX-P: Washington, D.C., March 26, 1970.

U.S. Department of the Air Force. Southeast Asia Construction Management. Memorandum, Deputy Assistant Secretary of the Air Force: Washington, D. C., December 12, 1966.

U. S. Department of the Navy. Analysis of Construction Capability Required in Vietnam (U). Memorandum, Naval Facilities Engineering Command: Washington, D. C., March 15, 1966 (CONFIDENTIAL).

________. Director, Pacific Division, Yards and Docks, Report to CINCPAC. July 30, 1965.

________. Command Brief. U.S. Naval Activity: Saigon, Vietnam, September 24, 1968.

________. Construction Constraints. Table II. Naval Facilities Engineering Command: Washington, D.C., January 20, 1967.

________. Management Actions. File, Item D.1, Naval Facilities Engineering Command: Washington, D.C., 1967.

________. Operation of the Service Force, U.S. Pacific Fleet, FY-67 (U). Commander, Service Forces, U.S. Pacific Fleet, n.d. (CONFIDENTIAL).

________. Readiness Actions for Southeast Asia (U). Memorandum, Secretary of the Navy: Washington, D.C., March 31, 1965 (SECRET).

________. Requirements for the Projected FY 1966 Military Construction, Republic of Vietnam (U). Point Papers, Naval Facilities Engineering Command: Washington, D.C., June 16, 1965 (SECRET).

________. RVN Construction Program. Memorandum, Director, Pacific Division, Bureau of Yards and Docks, December 22, 1964 (SECRET).

________. Sequence of Significant Events, Southeast Asia Construction, Item 80, "Chronology of Actions to Enhance Capability". Naval Facilities Engineering Command: Washington, D.C., July 20, 1965.

________. Southeast Asia Coordinating Group Note. 11010, Vol. 11, Naval Facilities Engineering Command: Washington, D.C., April 13, 1967.

________. Stinger System, The, Publication,NAVFACENCOM: Port Hueneme, Calif., n.d.

________. Supplemental Data for Congressional Hearings. Memorandum, Naval Facilities Engineering Command: Washington, D. C., February 1967.

U.S. Joint Chiefs of Staff. Construction Management in Vietnam. Memorandum SM 39-66: Washington, D.C., January 14, 1966.

________. Logistic Improvement in South Vietnam (U). Memorandum, Director of Logistics: Washington, D.C., February 5, 1965 (SECRET).

________. Unlettered, Untitled Appendix to the Report by the Special Military Construction Study Group: Washington, D.C., February 10, 1969.

________. Southeast Asia Construction Plan (U). Memorandum: Washington, D.C., April 25, 1965 (SECRET).

U.S. Office of the Joint Chiefs of Staff. Instructions for Base Development Planning in Support of Joint Contingency Operations. SM-643-69: Washington, D.C., October 1, 1969.

U.S. Office of the Secretary of Defense. Joint Logistics Review Board. Memorandum, OSD: Washington, D.C., February 17, 1969.

U.S. Pacific Fleet and Pacific Ocean Areas. Planning and Preparation in Connection With the Establishment of Facilities at Advanced Bases, General Pacific Area. Letter, Headquarters of the CINC, April 28, 1944.

Walter, Francis J. (Maj., U.S.A.). "The Application of the Network Analysis System in Operational Planning by the Field Army Engineer — A Doctrine". Thesis, U.S. Army Command and Staff College: Fort Leavenworth, Kansas, 1965.

Walton, Albion W., Jr. (Capt., U.S.N.). "Contract Construction in Future Limited Wars". Student Thesis, Industrial College of the Armed Forces: Norfolk, Virginia, February 24, 1968.

Other

Hatch, John (Lt. Col., U.S.A.). Working Papers obtained from the Engineer Strategic Studies Group, Washington, D.C. Reviewed at Fort Leavenworth, Kansas during April 1971.

McCarthy, Eugene J., and Kennedy, Robert F. (Senators). Nationally televised press conferences, early 1968.

Wilson, W. K. Jr. (Lt. Gen. [Ret], U.S.A.). Review of Southeast Asia Construction Program (U). Briefing: Washington, D.C., April 17, 1967.